THE

Journal of the Society of Arts,

AND OF

THE INSTITUTIONS IN UNION.

111TH SESSION.] FRIDAY, JANUARY 20, 1865. [No. 635. VOL. XIII.

TABLE OF CONTENTS.

Announcements by the Council.

CANTOR LECTURES.

"ON THE REPRODUCTION OF NATURAL FORMS BY ART AND MANUFACTURE." By B. WATERHOUSE HAWKINS, Esq., F.G.S., F.L.S.

Mr. Hawkins will resume his Course, on Monday Evenings, as follows:—

JAN 23RD.—LECTURE IV.—On the fitness of designs, and their adaptation to the conditions of the materials in which they are to be produced. (Demonstrated by metal-work processes, sand-moulding, casting, and chasing).

JAN. 30TH.—LECTURE V.—On Ceramic Manufactures, with the Influence of the material on the design and its successful production—modern Terra Cotta, Della Robbia ware, Majolica, and Parian.

These Lectures are open to Members free of charge, and a Member has the privilege of introducing ONE Friend to each Lecture. A set of tickets for this purpose has been sent to every member.

ORDINARY MEETINGS.

Wednesday Evenings at 8 o'clock.

JAN. 25.—"On the Best Mode of Protecting London from the Ravages of Fire." By CHAS. F. T. YOUNG, Esq., C.E.

FEB. 1.—"On London Sewage, from the Agricultural Point of View." By J. CHALMERS MORTON, Esq.

DWELLINGS OF THE LABOURING CLASSES.

In consequence of the unanimous recommendation of the Conference on this subject which was held in June last, the Council have appointed a Committee with the view of instituting an inquiry, to ascertain if anything can be done to remedy or to mitigate the evils arising from the want of proper Dwellings for the Labouring Classes.

The following is a list of the Committee:—

Acland, T. Dyke.
Akroyd, E.
Bass, Michael T., M.P.
Belper, Lord.
Berners, Lord.
Best, The Hon. and Rev. S.
Blaine, D. Roberton.
Bosanquet, C. B. P.
Buccleuch, Duke of.
Buckingham, Duke of.
Burnell, George R.
Chadwick, Edwin, C.B.
Chance, Robert L.
Chester, Harry.
Cole, Henry, C.B.
Cowper, Rt. Hon. W., M.P.
Denton, J. Bailey.
Dillon, John.
Ducie, Earl.
Ebury, Lord.
Farnall, H. B.
Fostescue, Earl.
Foster, P. Le Neve, Sec. Society of Arts.
Fawcett, Professor.
Godwin, G.
Graham, P.
Greenhill, Dr.
Hamilton, Edward.
Hare, Thomas.
Harrowby, Earl of.
Hastings, G. W.
Hawes, Wm.
Holland, E., M.P.
Holland, E. T.
Hoskyns, C. Wren.
Lankester, Dr.
Lansdowne, Marquis of.
Letheby, Dr.
Lichfield, Earl of.
Lumley, W. G.
Malahide, Lord Talbot de.
Marsh, M. H., M.P.
Maynard, H.
Mill, J. Stuart.
Morton, J. Chalmers.
Redgrave, Samuel.
Salisbury, Marquis of.
Shaftesbury, Earl of.
Shaw, Benjamin.
Shuttleworth, Sir J. Kay, Bart.
Smith, Dr. Edward, F.R.S.
Smith, Professor Goldwin.
Sopwith, Thomas, F.R.S.
Stanley, Lord, M.P.
Teulon, Seymour.
Twining, T.
Walker, G. H.
Waterlow, Alderman.
Wellington, Duke of.
Williams, C. J.
Wilson, George F., F.R.S.
Ware, Martin, Secretary to the Committee.

To accomplish this object in the most satisfactory manner, it has been determined to divide the General Committee into Sub-Committees, to each of which distinct portions of the inquiry shall be assigned, so that the inquiry into each part of the subject may proceed simultaneously.

A Sub-Committee will undertake the inquiry—

1. Into the causes which appear to retard the erection of proper house accommodation, and the improvement of existing Houses for the use of the Working Classes, in London and other large towns.

2. Into the operation of Imperial and Local Taxation on such Dwellings.
3. Into the Laws relating to the Transfer of Real Property in small plots, and the conveyance of chambers or *suites* of rooms.
4. Into the operation of the destruction of Houses for Railways, and for other local improvements.
5. Into the desirability of facilitating the means of conveying labourers to and from their work by railways.
6. Into the pecuniary results of investments in Buildings for the Working Classes, either by Public Societies or by Building Societies.

A Second Sub-Committee will inquire—

1. Into the causes which retard the erection of Cottages in the rural districts.
2. Into the effect of facilitating the conveyance of small plots of ground for cottages and gardens, as well upon landlords as on workmen.
3. Into the effect of relieving—in the interest of the public only—certain classes of dwellings from all, or a portion of, local and imperial taxation.
4. Into the effect of extending the areas of local taxation, either to the union or the county.

A Third Sub-Committee will inquire—

1. Into the operation of the Laws of Settlement and Removal.
2. Into the advantages or otherwise likely to arise from the establishment of a National Poor Rate.
3. Into the provisions contained in various existing Acts of Parliament for granting Loans for the improvement of Estates, and whether such provisions cannot be applied to improvements of estates arising from building Cottages thereon; and if so, what special conditions should be imposed on grants to be applied to such purposes.
4. Whether the provisions of the Common Lodging House Act, the Health of Towns Acts, and other Statutes relating to Public Health, may not be advantageously extended.
5. And whether there are any other means by which the Legislature can promote the object in view.

Members of the Society interested in this subject are invited to communicate with the Secretary of the Society.

ART-WORKMANSHIP.

The following letter has been addressed to about forty of the principal City Companies:—

GENTLEMEN,

The Society of Arts has for a long period endeavoured to improve the artistic taste and skilful manipulation of the Art-Workman.

It has sought to accomplish this by exhibitions of their works, and by giving prizes for the best works executed from examples provided by the Society, and, in the case of wood-carving, from the original design of the workman.

Last year and this year, the prizes given by the Society have been on a much larger and more comprehensive scale than before, amounting last year to between £500 and £600; and the adjudication of the prizes has been kindly undertaken by gentlemen of acknowledged taste and high professional reputation.

The Council of the Society, satisfied that great good has been done by these efforts, and urged forward by the members of the Society, and by members of various trades requiring the aid of well-trained and skilful workmen, venture most respectfully to ask for the co-operation of the City Companies in promoting this practical mode of stimulating the energies and encouraging the self-education of the Art-Workman.

To this end the Council of the Society submit to the consideration of your honourable Court whether a sum of money might not be appropriated as prizes, say of £15, £10, and £5, for works to be executed by art-workmen in the branch of manufacture or of art represented by your guild; for, although your guild may not now be directly connected with the production of works of art, the Council venture to suggest that every corporation is interested in the general question of good taste, and in seeing the products of it when it meets together. In any case they think that models or drawings of some of the valuable works of art belonging to your worshipful Company might be offered for imitation, especially in the precious metals. I may add that any prizes that your Company may be pleased to offer now will not be required till about this time next year.

The Council, in order to afford your honourable Court an opportunity of appreciating what the Society of Arts is now doing, previously to your arriving at a decision on this subject, will be gratified if you can attend a meeting, at the Society's Rooms, on Tuesday, the 17th January, at four o'clock, when the works executed by art-workmen this year, in competition for the prizes offered by the Society, will be exhibited, and every information relating to this subject—in which the Society feels great interest, and to encourage which they desire your co-operation—will be afforded. I am directed to say that if the Master of your Company wish it, I have instructions to call on him and afford him full explanations.—I have the honour to be, Gentlemen, your obedient servant,

P. LE NEVE FOSTER, Secretary.

P.S.—Any member of your Court will be admitted upon giving his card, with the name of the Company of which he is a member written thereon.

To the Master, Wardens, and Court of Assistants, of the Worshipful Company of ——

Proceedings of the Society.

CANTOR LECTURES.

THIRD LECTURE.—MONDAY, JAN. 16.

Mr. HAWKINS commenced his lecture by drawing a parallel between the state of general education and the present state of art education. A few years ago the Society of Arts began their present system of examinations in general knowledge, in order to facilitate the education of the middle and industrial classes of society, but art education was still left in the same condition as that in which general education was placed a quarter of a century ago. Mr. Hawkins, therefore, suggested that the Society of Arts should do for art education what they had already done for the other branches of knowledge. The lecturer proceeded to speak of ornamental art as distinct from mere pictorial representation, and as connected with manufactures. He stated that the ornamentist required a more intimate knowledge of the structure of the forms of those animals which he intended to introduce into his designs, than the mere painter of pictures, who could always have a model before him and represent what he saw, whereas it was necessary that the ornamentist should possess the power of representing animal forms in any of the varied attitudes that he might desire without the presence of a living model. Mr. Hawkins pointed out the error that was made in supposing that the mere *reproduction* of natural forms is ornamentation, and said that the use that *ought* to be made of animals in ornament was to so adapt their attitudes that they shall fall into the lines of the design without violating nature. He referred to Mahomedan art (from which animal forms were excluded) as the perfection of the conventional treatment of the forms of vegetable life, and Indian and Chinese art as the perfection of ornamental combinations on which animal forms were introduced. The lecturer illustrated his

argument throughout with sketches on the black canvas, particularly of symbolic forms, the Nineveh bull, the Sphinx and Centaur, flying and aquatic dragons, &c.

SEVENTH ORDINARY MEETING.

Wednesday, January 18th, 1865; William HAWES, Esq., Chairman of Council, in the chair.

The following candidates were proposed for election as members of the Society :—

Beloe, Chas. H., 26, Bedford-place, Russell-square, W.C.
Bishop, James, 176, Upper Thames-street, E.C.
Bowring, John, 51, St. Mary-axe, E.C.
Dean, John M., The Grove, Stratford, E.
Gibson, John, 1, Stamford-terrace, Stamford-hill, N.
How, Thomas, 29, Gloucester-place, Hyde-park, W.
Hughes, Joseph, 37, Queen-street, Ratcliff, E.
Lavey, Charles, 341, City-road, E.C.
Parker, George Bass, 25, Grove-terrace, Highgate, N., and 4, King-street, Cheapside, E.C.
Paty, General Sir George William, K.C.B., 24, Regent-street, S.W.
Peard, Thomas, 159, High Holborn, W.C.
Pendergast, John, 103, Adelaide-road, N.W.
Pike, Fred., 44, Charing-cross, S.W., and Dulwich, S.E.
Pitman, William, 210, Euston-road, N.W., and 88, Newgate-street, E.C.
Plowden, Trevor Chichell, Oriental Club, S.W.
Plucknett, George, 258, Gray's-inn-road, W.C.
Pratt, Hodgson, 8, Lancaster-terrace, Regent's-pk., N.W.
Rejlander, O. G., 129, Malden-road, N.W.
Robinson, Thomas, 260, Gray's-inn road, W.C.
Roebuck, William, 21, Ellington-st., Arundel-square, N.
Sconce, Gideon C., 48, Lincoln's-inn-fields, W.C.
Sexton, George, M.D., 63, Springfield-road, St. John's-wood, N.W.
Sharp, Henry Locker, 15, Great Cumberland-street, W.
Shaw, Maltman Wm., 24, Carlton-hill-villas, Camden-road, N.W.
Stanton, John, M.D., 9, Montagu-square, W.
States, William, 12, Prince's-street, Hanover-square, W.
Stevens, Henry, M.D., 78, Grosvenor-street, W.
Stewart, Donald, 7, Gloucester-terrace, Regent's-park, N.W.
Stuart, Charles, Manor-house, Stepney-causeway, E.
Taylor, John Henry, The Limes, Upper Holloway, N., and 15, South-street, Finsbury, E.C.
Teape, Hannaniah, 37, Trinity-square, Tower-hill, E.C.
Thomas, William, 20, Boltons, West Brompton, S.W.
Thorold, Rev. Anthony Wilson, 16, Bedford-square, W.C.
Vickers, Stanley, Hill House, Streatham-common, S.
Waller, Edmund, 217, Brompton-road, S.W.
West, William Nowell, 38, Montague-street, Russell-square, W.C.
Whytock, Alexander, 9, George-street, Edinburgh.

AND AS HONORARY CORRESPONDING MEMBER.

Honeyman, Rev. D., D.C.L., Antigonish, Nova Scotia.

The following candidates were balloted for and duly elected members of the Society :—

Bayley, John C., 1, Park-place-villas, Maida-hill, W.
Buxton, William, Lime-tree Lodge, Rotherhithe, S.E.
Hancock, Henry J. B., Duke's-hill, Bagshot.
Knight, John Peake, South Eastern Railway, London-Bridge, S.E.
Lowe, John Stanley, 31, Cornmarket-street, Oxford.
Melliss, George Whalley, 17, Talbot-terrace, Westbourne-park, W.
Parnell, Hugh, M.A., 3, New-square, Lincoln's-inn, W.C.
Strachan, Charles Henry, 51, King's-road, Camden-town, N.W.
Vincent, Henry, 28, Mornington-crescent, N.W.

The following Institutions have been received into Union since the last announcement :—

Darwen, Mechanics' Institutiou.
Redditch, Literary and Scientific Institute.

The Paper read was—

ON THE BEST MODE OF APPLYING POWER TO PROPEL TRAINS ON THE METROPOLITAN AND OTHER RAILWAY LINES HAVING FREQUENT STATIONS, AND IN TERMINAL STATIONS.

By PETER W. BARLOW, ESQ., F.R.S.

My attention was first especially directed to the subject of the motive power on railways in the year 1844, when I was instructed by the directors of the South-Eastern Railway to report on the applicability of the atmospheric system to the Tunbridge Wells branch of the South-Eastern Railway, and my investigation, containing some experiments on the Tyler-hill incline of the Whitstable Railway, was laid before the Institution of Civil Engineers in 1845.

In the year 1848, on the opening of the North-Kent Railway, the locomotive superintendent reported to me that a much greater consumption of coke occurred than with similar trains on the main line, which was supposed to arise from the smaller radii of the curves and steeper gradients.

The stations being more frequent on this line, it was necessary, in order to understand the cause of this loss, to distinguish what portion of the total power was required to put the trains in motion as distinguished from that employed in traction, and I calculated the acceleration of trains with varying tractive power, which was compared with the observed acceleration of locomotive trains on the South-Eastern and Great-Western Railways, and with the experiments made by Mr. Stephenson on the Atmospheric Railway at Dalky.

It is sufficient for the present purpose to say that, with with due allowance for the loss of tractive force with increase of velocity, the experiments fully confirmed the theoretical calculations, and left no doubt of the practical accuracy of the formula. (See Appendix.)

In the progress of these experiments on locomotives, I remarked the serious loss of time which arose in getting the train into speed; and it will be seen by referring to the tables that on the South-Eastern Railway, at that time, one and a half to two miles was generally required to get the train into full speed, and, on the Great-Western, between three and four miles; and it became apparent, by testing the rate of acceleration due to the tractive power of the North-Kent engines, that it was impossible to make the journey (stopping at every station) in the time required, even if the trains had no friction or incline to contend with.

The only remedy was engines of greater tractive power and weight, and these have been adopted to such an extent, to meet all cases, that, under favourable circumstances, a momentum and velocity is given to the train in 150 yards that would be sufficient to take it half a mile on the level if the engine was detached; and having recently observed this fact, it occurred to me that in working metropolitan lines, with frequent stations, sufficient power might be given at the station by stationary power to propel the train, without the aid of a locomotive, to the next station; and having, upon careful consideration, arrived at an opinion that such a mode of working will give a greater average velocity, and be apparently superior in other respects to the use of locomotives in such cases, I have been desirous to lay my investigation of the subject before this Society, as a matter deserving of discussion, from its important effect on the capability of metropolitan railways to relieve street traffic.

In the ordinary duty of locomotives, as employed upon

the great systems of railways, the distance between the stations or points of stoppage is such that the great and important duty of the engine is to maintain the requisite speed after that speed has been acquired; and one of the first facts which an inquiry into the subject cannot fail to establish is, that the locomotive engine is admirably adapted for this purpose; and, as regards the fuel expended for a given amount of work, it is one of the most economical forms of engine in use.

This result will appear, whether we take the work performed by an express engine in a fast train, or a heavy goods engine drawing a slow train; and in either case it results that, provided the distance between the stations is large, so that the engine can work for a considerable time, exercising its power at a fair working speed, the economical working of locomotive engines, comparing the work done with the fuel consumed, become manifest.

When, however, the duty to be performed is that of working a line in which the stations are very close together, and the stoppages frequent, it then results that all, or nearly all, the work of the engine is expended in acquiring the travelling speed; and that, in fact, it has not ceased to accelerate its speed when it becomes necessary to shut off the steam and apply the brakes, so as to stop at the next station. In fact, the same engine which in long stages would make an average speed of 35 or 40 miles per hour, is incapable, with frequent stations, of making an average speed of 13 or 14 miles, even with a greatly reduced load.

In this condition of things, which is in fact the condition of metropolitan railways, a new set of circumstances has to be met, and the question arises whether, where these circumstances exist, stationary power, when applied in a manner strictly adapted to the case, is not more economical—capable of greater speed—and in all respects more suitable to the convenience and exigencies of the traffic than locomotive power?

In terminal stations the use of stationary power will add much to the simplicity of working. At present, as the locomotive arrives in front of the train, it is made prisoner until the train is removed. It has then to go to another part of the station to be turned on to take in coke and water, and then comes back again to the train it has to take out. These frequent operations not only wear out the road and points and crossings very rapidly, but cause constant stoppages to trains arriving to enter the station. To avoid a portion of this difficulty, the locomotives are sometimes run tender first, a mode of working which amounts to an admission of imperfection, and appears to foreshadow a change in the present system, particularly as the more the traffic increases the more these imperfections will be felt. When the stations are near together the time required to acquire the speed is so important an element that greater tractive power is requisite to enable a reasonable average speed to be maintained; and the power of the engine is governed by the power requisite to put the train into motion. Thus the actual power exerted to propel trains of forty tons every five minutes each way on a railway similar to the Metropolitan, of three and a half miles in length, at the velocity now adopted, would not, allowing one-third 214 horses, lost power, and 15lbs. per ton traction, exceed to obtain which at least ten locomotives, capable of exerting in the aggregate a power of 2,200 horses, are required in consequence of the combined losses from the extra weight to be conveyed, the power to overcome the inertia, and, thirdly, from the engine being restricted from making a fair working speed, these losses being in addition to that of the engine itself from friction, &c.

Seeing that it is necessary to use such powerful engines to passenger trains where the stoppages are frequent, it follows that the weight of the engine becomes large in proportion to the weight of the train, and therefore, if that weight can be dispensed with, much less power will suffice to give the same amount of speed, or, with the same amount of power applied, a much greater speed will be obtained. In like manner if the weight of the engine is dispensed with the train can be brought to rest in less time by means of the brake; and coupling this with the increased rapidity with which the speed at starting can be acquired, it follows that dispensing with the weight of the engine would be of very great advantage in the case of stopping trains. In order to show the disadvantages under which locomotives act when stations are frequent, a comparison is here made of the speed which will be obtained by a locomotive weighing 40 tons, having an effective tractive power of 4,000 lbs., with a stationary engine of the same power, and one of 8,000 lbs. tractive power, the stations being assumed to be 1,000 yards apart, and the railway in the first place level, the second on a gradient of 1 in 200, and the third on a gradient of 1 in 100.

The rate of acceleration is correctly represented by an incline obtained by dividing the total weight conveyed by the effective power, and will be understood by the diagrams on the next page, in which the line - - - - - - represents the incline due to the locomotive; the ..... line that due to the stationary power with four thousand lbs. tractive force; and the line — - — - — - that due to eight thousand lbs. tractive force. The following tables show the relative inclines and velocities:—

No. 1.—RAILWAY LEVEL.

POWER EMPLOYED.	Incline representing rate of acceleration.	Distance the power acts.	Time of passing 1,000 yards.		Average velocity per hour
		Yards.	Min.	Sec.	Miles.
Locomotive train tractive power 4,000 lbs.	1 in 56	794	1	57	17½
Stationary engine tractive power 4,000 lbs.	1 in 25	455	1	28	23
Stationary engine tractive power 4,000 lbs.	1 in 12	216	1	16	27

No. 2.—GRADIENT 1 IN 200.

POWER EMPLOYED.	Incline representing rate of acceleration.	Distance the power acts.	Time of passing 1,000 yards.		Average velocity per hour.
		Yards.	Min.	Sec.	Miles.
Locomotive train tractive power 4,000 lbs.	1 in 78	853	2	12	15½
Stationary engine tractive power 4,000 lbs.	1 in 28½	523	1	31	22½
Stationary engine tractive power 8,000 lbs.	1 in 13	228	1	18	26

No. 3.—GRADIENT 1 IN 100.

POWER EMPLOYED.	Incline representing rate of acceleration.	Distance the power acts.	Time of passing 1,000 yards.		Average velocity per hour.
		Yards.	Min.	Sec.	Miles.
Locomotive train tractive power 4,000 lbs.	1 in 125	905	2	37	13
Stationary engine tractive power 4,000 lbs.	1 in 33	405	1	34	21¾
Stationary engine tractive power 8,000 lbs.	1 in 13·4	242	1	20	25½

Fig. 4 is given to represent the relative velocities of the locomotive and stationary engines.

FIG. 1.—RAILWAY LEVEL.

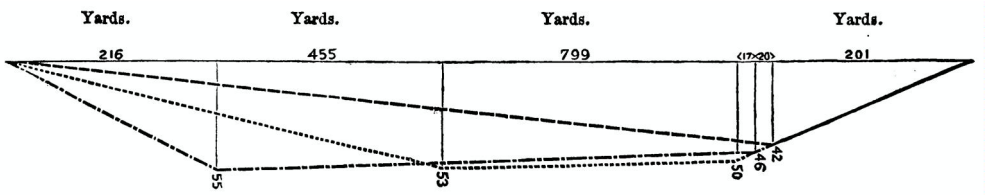


FIG. 2.—GRADIENT 1 IN 200.

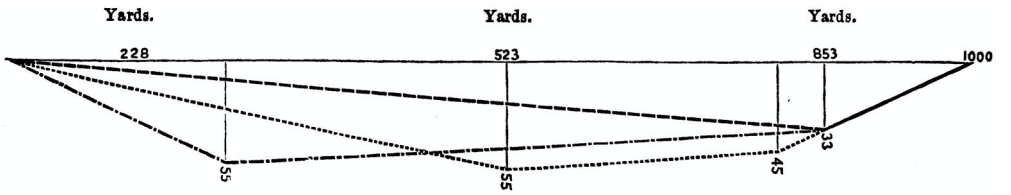


FIG. 3.—GRADIENT 1 IN 100.

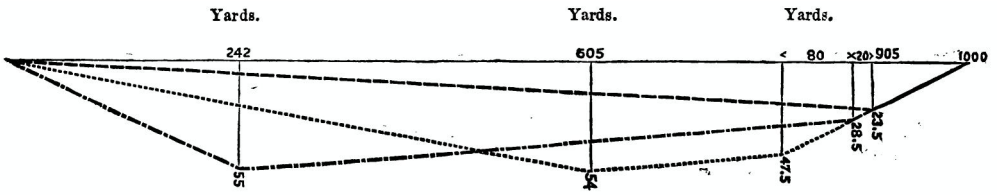


	FIG. 1. Miles per hour.	FIG. 2. Miles per hour.	FIG. 3. Miles per hour.
Locomotive power ------ Average velocity	17½	15½	13
Stationary equal power ..... ,,	23	22½	21¾
Stationary double power — - — - ,,	27	26	25½

It will be seen, by reference to the table, that in the case No. 1, viz., level, the velocity has been increased from 17½ to 27 miles per hour, and the time saved 41 seconds. In No. 2 gradient, 1 in 200, the velocity has been increased from 15½ miles to 26 miles per hour, and the time saved 54 seconds; and in No. 3 gradient, 1 in 100, the velocity has been increased from 13 to 25½ miles per hour, and time saved 1 minute 17 seconds.

It will also be observed that the tractive force of the stationary engine, when double that of the locomotive, has been employed less than one-third of the distance, and therefore greater velocity has been obtained with less expenditure of power; and hence arises an important feature in favour of stationary power, as proposed to be applied, as not only less actual power is required, but, a short length only of propelling power being necessary, the loss of power and liability to derangement hitherto experienced in stationary power will, in a great degree, be avoided. The obtaining increased velocity with less power is apparently an anomaly, but its correctness will readily be seen, and will be illustrated by the experiment of applying a tractive power, by means of a weight sufficient to propel a carriage with a small acceleration. By applying four times that weight for a quarter the distance the acceleration is very rapid, and the average velocity will be increased with the same expenditure of power, and in degree depending upon the ratio of the accelerating power to the load in the two cases. I am, therefore, able to claim for stationary power, when stations are frequent, the advantage of superior speed, an advantage which has been found to be of importance to the success of railways generally, and their influence in the districts through which they pass, and one which there is no reason to doubt will equally influence the development of the traffic of metropolitan railways, if not to a greater degree, because the saving of time is at present less decidedly in favour of railways.

If stations were a little more frequent than they are, a good cab would still remain the quickest mode of travelling; and it is so now, unless the railway runs direct to the point to which a passenger is destined. Speed is also important, from enabling more frequent trains, and therefore a larger amount of traffic, to be carried on one line of railway.

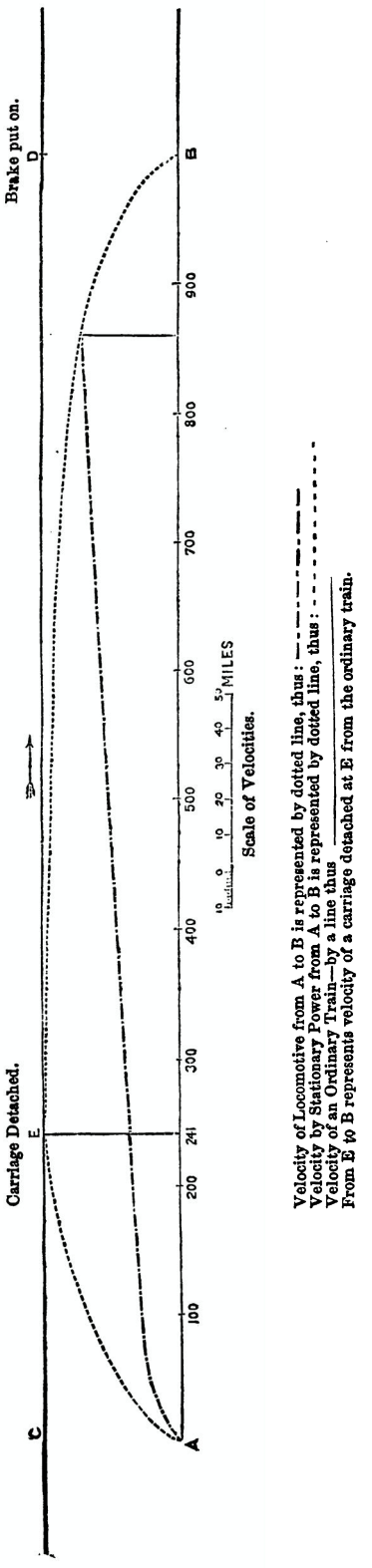


FIG. 4.—DIAGRAM OF RELATIVE VELOCITIES.

The economy arising from stationary power is not here advanced as of the usual importance in railways, perfection of working being rather the point to be aimed at, as it would pay itself from the development of traffic in a metropolitan railway, even at greater outlay and cost, but as the economy claimed is so great as nine-tenths, with equal velocities, it is necessary to explain how this extraordinary difference arises. That the loss from the use of locomotives on metropolitan lines is fully nine-tenths of the power employed, is pretty evident, because the total duty performed in propelling trains of 40 tons every five minutes, equal to forty tons 84 miles per hour, or 200 tons 16⅘ miles per hour, is not greater than one of the locomotives employed (which are in fact equal in tractive power to goods engines), would perform on a main line as a fair day's work, and the cause of this loss it is not difficult to comprehend. As before stated, it arises from three causes:—1st. The increased weight of the train from the addition of the weight of the engine. 2nd. The loss in overcoming the inertia of the train and consequent application of the brake; and 3rd. The large proportion of the time the locomotive is under steam, as compared with that on which it is employed advantageously in traction. The degree of economy from the weight of the locomotive being saved of course depends on the relation of its weight to that of the train. On railways worked by stationary engines, the weight and friction of the rope, from its great length, generally exceeds the loss from the locomotives; but in metropolitan railways the locomotives are required to be of such weight as nearly to equal that of the train, and, therefore, half is directly lost from this cause.

The loss from overcoming the inertia of the train will be arrived at by comparing the power employed in each case. If the double power represented by the line - - - on the diagram is continued for 100 yards, the velocity on the level will be 27 miles per hour; and if the train is allowed to run by its own momentum it will be 18½ miles at the point where the brake is applied, producing an average of 20 miles, a velocity considerably exceeding the locomotive. The power exerted will be as 200 to 799, or as 1 to 4 nearly. This explains a loss of ¾ of the locomotive power, the remainder making it $\frac{8}{10}$, being due to the locomotive not being an accumulating power, or, in other words, the power exerted in the two cases is as 1 to 4, while the engine power necessarily employed is 1 to 10, from the engine being restrained from making a fair working speed.

The case here assumed for illustration is that of the railway being level. On gradients exceeding 1 in 200 it will be necessary to have a greater velocity than is now made by locomotives to give sufficient momentum, and thus a direct comparison cannot be made; in fact, the advantage claimed for stationary power, is the means of giving increased speed combined with great economy rather than that of excessive economy with the same speed. There is no doubt, however, that a saving could be made of two-thirds of the present cost, still giving a large improvement in speed.

Frequent trains are, in the opinion of experienced persons, both in this country and in America, necessary to develope the omnibus traffic; and there is no reason why, with stationary power, from the improved velocity, they could not be made to run every three or four minutes, allowing sufficient time for one train to leave its station before the following train was allowed to start. This could not be done without locomotives treble in number to the stationary engines, even if there was required to be one stationary engine at every station. Another source of economy will arise by stationary power, from less destruction of the permanent way, and, in underground railways, from a less dimension of tunnel being required when a single line is used.

The two important points of comparison, viz., speed and economy, are here shown to be in favour of stationary

engines, and as the avoidance of the locomotive would be a benefit to the travelling public, particularly in tunnels, and equally so to the residents on the line, by reducing the noise and vibration, and is also decidedly conducive to safety, stationary engines would appear to be the superior mode of working railways with frequent stations unless there arise practical objections to balance these advantages. Two objections have been suggested; one, that the rate of acceleration will be so rapid as to be unpleasant to passengers; and the second, that in the event of a train, from any cause, being stopped between stations, it would be left in a helpless condition for want of locomotive power

With reference to the first objection, it is only necessary to observe that the rate of getting into motion will not produce a greater velocity than 11½ miles per hour at the end of 50 feet, which is not so great a rate of acceleration as arises in a carriage propelled by horses; in fact, if the rate of acceleration which now arises with locomotives in descending gradients was given to trains on the level and in ascending, a very important saving of time would be made, and no objection could arise on this point. With reference to a train being stopped between stations, it must be assumed that the momentum given to the train would be such that considerable brake power would be always required to stop it at the next station. The distance the train is to be propelled by momentum is much less than is done every day by detached carriages on the principal lines of railway; in fact, every locomotive train is propelled the latter part of its journey by momentum; and in the case of express trains more than a mile is required to stop, with the assistance of the brakes. The Greenwich and Blackwall Railways were worked into London by momentum nearly as far as is here proposed, and were never known to fail as long as the engine power acted properly. The cause of interruption to the traffic by an accident to the locomotive itself will be avoided, and that which now occasionally arises from the repair and renewal of the permanent way will be much reduced. On a metropolitan line devoted exclusively to passenger traffic, there are no level crossings, and the public are entirely excluded, so that the stoppage of the train, except from accidents, will be very rare, and no train would leave one station until the line was signalled clear to the next. A pilot locomotive, in case of accidents, would be used as at present, as the mode of applying the stationary power will not prevent the occasional use of locomotives.

On the Mode of applying the Stationary Power.

The mode of applying stationary power here suggested differs from that hitherto employed, inasmuch as it is not connected from station to station, or connected through several stations, like the Blackwall system, but each has a propelling power independent of the other, although the power may be derived at several stations from one engine. It also differs in that the power is used accumulatively, and thus a smaller power of engine is required.

I will now observe that the result of the experiments on the Whitstable Railway, previously referred to, and the examination generally of the subject of motive power, led me to recommend the Directors of the South Eastern Railway to substitute locomotive, and abandon the stationary engines on that line; and the alteration was attended with satisfactory results, not because there was any serious difficulty in the rope system, except its great weight and length, but because one locomotive was made to do the work of all the stationary engines, and a greater average speed was obtained. One of these ropes was 1 mile 70 chains in length; and on the Blackwall Railway the rope was above three miles in length to carry passenger traffic. Great mechanical skill and good workmanship is indicated by the fact that such a piece of machinery could be kept in order for any length of time, because the actual weight put in motion, and inertia to be overcome, in addition to the train, was much greater than that of a locomotive, besides the friction of 500 sheaves. These cases, however, prove that no practical difficulty or liability to derangement is likely to arise in the use of a rope for 150 or 200 yards only, as is now proposed; and it may be here remarked that although ropes have been superseded by locomotives in many cases, yet that still a large amount of traffic is carried on by ropes, and in one important instance, viz., Glasgow, the locomotives have been again abandoned for the rope on an incline of 1 in 43 for one mile fourteen chains used for passenger traffic.

The mode which first occurred to me of applying the stationary power for the present purpose, was, by Sir W. Armstrong's hydraulic principle, to give motion to a rope, which system has the advantage that one engine can be made to do the work of several stations by a water main laid along the line. Another form of propeller, very simple in its action, but requiring an engine at each station, is the descent of a weight raised by a small engine constantly at work.

The power expressed by a weight of forty tons raised thirty feet every two minutes and a half would propel a train of forty tons more than one mile and a quarter on the level before it came to rest; and a stationary engine of forty-eight-horse actual power, allowing one-third loss, would be sufficient to run forty-ton trains every five minutes each way, allowing for the loss from friction and the power required to bring the weight to a state of rest, which latter loss would amount to ten per cent. of the power. The cost of working such an engine, including repairs, would not amount to £2 10s. per day, so that the cost per train per mile would be under 2d. The trains may also be propelled on the atmospheric principle, either by the old plan, of a pipe, or Mr. Rammell's plan, of a small tunnel; and as the power is required only for a short distance, there will not arise the difficulty from friction and leakage which has hitherto been experienced in these modes of traction.

In another form of propeller suggested, which is specially adapted to frequent trains, the accumulation of power is made in the boiler. Driving wheels and cylinders, similar to a locomotive, are used to propel a rope for the required distance. The total weight of moving machinery will not in this case, including the rope, exceed four tons. A duplicate of every part, including the boilers, would be provided, and as there is an interval of eight hours' rest in each day, sufficient to replace any part which might be out of order, I submit that such a piece of machinery may be considered nearly safe from derangement. A propeller of either kind, it is suggested, could be used advantageously on railways worked by locomotives, for the purpose of starting trains from stations situated at the foot of inclines, where now locomotives, although generally master of their work, frequently fail in surmounting the incline, thus leading to loss of time and danger.

In conclusion I will observe that it is difficult for the author to describe a new suggestion without a bias in its favour, but I have endeavoured to lay the comparative merits of stationary and locomotive power fairly before the meeting. The subject is so important in its influence on the value and extension of metropolitan railways, that I offer it for discussion without venturing to give a decided opinion of my own, until I hear the views of those eminent engineers who have devoted their attention to the subject of motive power, and which views, I hope, will be expressed on this occasion.

APPENDIX.

The formula used in calculating the acceleration is:—

$$v = 2\sqrt{\frac{P \pm \frac{T}{I} - \frac{T}{2240\,f}\,S.\ 16\frac{1}{2}}{T}}$$

I being the inclination of the railway.
P the tractive power.
T weight of train in lbs.
S length of the plane.
f friction of the train per ton.

The velocity given to a train of 40 tons by 4,000lbs. falling 600 feet or 8,000lbs. falling 300 feet, the friction being 15lbs., will be:—

$$2\sqrt{\frac{(8000 - 600) \quad 300 \times 16\frac{1}{2}}{89{,}600}}$$

$$2\sqrt{\frac{(8000 - 600) \quad 300 \times 16\frac{1}{2}}{89{,}600}} = 27 \text{ miles per hour.}$$

The power exerted will be for five-minute trains.

8,000lbs. falling 300 feet in two minutes and a half.

$$\text{or } \frac{8000 \times 300}{2\frac{1}{2}} = 940{,}000\text{lbs. in one minute.}$$

$$\frac{940{,}000}{33{,}000} = 28\tfrac{1}{2} \text{ loco. power} \times 5 = 142{\cdot}5.$$

add one-half..... 71·25.

213·75.

DISCUSSION.

Mr. BARLOW said, before he described the experiments he had to bring before the meeting he wished to add a few remarks to what he had written. In suggesting a substitute for the locomotive he had no intention to undervalue the qualities of that engine; on the contrary, he regarded it as the master piece of mechanical engineering, and the results it produced were perfectly astonishing, as also was the amount of duty it was capable of performing; he entertained the highest respect for those men whose talent and thorough knowledge of the subject had brought that machine to its present state of perfection. He appeared before them, therefore, not as an opponent of the locomotive, but rather as a great admirer of it; and he merely suggested that this noble machine, when employed as the motive power on a railway of short length and frequent stations, was not able to exercise more than about one-tenth of its power. What he (Mr. Barlow) submitted was, that under certain circumstances stationary power might be employed with advantage; and because it had failed under other circumstances there was no proof that it would not succeed under those which had now arisen. The alteration he suggested in the application of stationary power, consisted in this—that instead of applying that power between station and station, he applied it for such a distance that the momentum, or *vis viva* of the train, was brought into play, and this was as much a force as the force of steam, and could be depended upon as well as any other force. He proposed to apply the power of the rope for such a portion of the distance that the momentum of the train would carry it with perfect certainty to the next station. The advantage of applying it for a portion of the distance and allowing it to act in that way, arose from a particular law of accelerating forces, from which it resulted that a greater tractive force applied for a portion of the distance would accumulate a momentum that would give greater speed than a smaller tractive force applied for the whole distance, the actual *power* being the same in each case, because the greater force acts for a proportionately less distance. Mr. Barlow then proceeded to illustrate this principle by a model of a carriage propelled by means of a weight suspended. By applying four times the tractive force for a quarter of the distance only, he obtained greater velocity over the whole distance than by applying the tractive force for the whole distance. The difficulty with regard to stationary power hitherto had been the great length and weight of the ropes; but with short ropes he submitted they could manage the machinery perfectly well. Another experiment was shown, to prove that by reducing the weight of the carriage by about one quarter, double the velocity was obtained with the same amount of motive power. This was brought forward to show that where the duty of the locomotive engine was an accelerating and not a tractive power, by relieving the train of the weight of the engine, they did more than save the mere weight of the engine, and therefore produced a greater economy on lines where there were frequent stations than on lines where the duty of the engine was entirely of a tractive character. The principle of accelerating force was further illustrated by the motion of a ball rolled down first a gentle incline, and then down a steep incline, and so carried by its momentum up a gradient to the same level as before, but with a greater velocity. This explained why a greater velocity was obtained when the same power was employed over a shorter distance.

Mr. IMRAY said that as, in the course of several conversations with Mr. Barlow, that gentleman had asked him to look into his calculations, he would now venture to state his opinion as to their accuracy, and to explain as briefly as possible the view he took of the principle on which Mr. Barlow had based them. It might, at first sight, be difficult to understand how by a temporary impulse given to a train, instead of a continuous traction being applied to it, there could be an economy of power for a given speed, or an increase of speed for a given power. The illustration which Mr. Barlow had given of a ball rolling down one incline and thereby acquiring momentum sufficient to carry it up another incline, appeared to him to embody the whole principle under discussion, and he would endeavour to apply, as clearly and briefly as he could, the same principle to the case of a railway train running on a level. From the experiments made by Pambour, it appeared that the resistance to the motion of a train amounted on the average to 10 lbs. per ton or $\frac{1}{224}$th of the weight in motion. The experiments conducted by the British Association seemed to show that this resistance amounted to about 8 lbs. per ton, or $\frac{1}{280}$th of the weight. Since those experiments were made, great improvements had been effected, both in the carriages and in the permanent way; but, without laying any stress on that circumstance, he would merely take the mean of the above figures, and state the resistance as about 9 lbs. per ton, or about $\frac{1}{250}$th. It might, in fact, be taken that a train in motion was subject to a constant retarding force equivalent to that which it would, without friction, encounter in running up an incline of 1 in 250. If then a train were started with the velocity which it would acquire in descending such an incline, it would, leaving friction out of account, ascend that incline before its velocity entirely vanished. Assuming that the stations were one mile apart, and that it would be desirable for the train to retain a certain amount of speed, say seven or eight miles per hour, to be overcome by the brakes on reaching the farther station, the length of the incline might be taken at 6,000 feet. The gradient being 1 in 250, the total height of the incline measured from base to summit would thus be 24 feet. In other words, a train descending through 24 feet of vertical height would attain sufficient velocity to carry it one mile on the level, retaining at the end of the mile a velocity to be arrested by the application of the brakes. The power necessary to effect this upon a train weighing 40 tons or 89,600 lbs., would be 89,600 × 24 = 2,150,400 foot lbs., or equivalent to the work of a 65-horse engine during one minute. As to the mode of giving this velocity, he would not trouble the meeting with any remarks, for that was rather a question of practical engineering than one of figures, to which he now wished to confine himself. Let it, however, be assumed, for illustration, that the velocity was given to the train by causing it to descend an incline of 100 yards, or 300 feet, in length. The total descent being 24 feet vertical, this would give an incline of 1 in 12½, or a tractive force of 721 lbs. for a 40-ton train; and whether the velocity were given by the descent of such an incline, by the application of rope traction, or by any other means, the power expended and the result produced would be precisely the

same. As to the objection which would, no doubt, be raised to Mr. Barlow's system, because the velocity would be too rapid, or rather too suddenly imparted, he was of opinion that it was quite groundless. The rate at which a passenger was put in motion in a cab or omnibus considerably exceeded that contemplated in the case in question. Any one that had taken a trip on the "Montagne Russe," where the descent was something like 1 in 4, must have experienced a start something like three times as sudden as it would be in the case under consideration, and he (Mr. Imray) would observe, for his own part, that the sensation on the "Montagne Russe" at starting was rather pleasant than otherwise. To quote another instance, that of the Cycloidal Railway, where the passenger was inverted in his progress towards the terminus, the descent at starting was something like 1 in 2, and certainly no unpleasant shock was occasioned at the start in this apparently perilous journey. He regretted having occupied the time of the meeting so long with dry figures, but he trusted that he had succeeded in confirming the truth of Mr. Barlow's calculations, and he had only to thank his hearers for the patient attention with which they had listened to his observations.

Mr. ZERAH COLBURN remarked that he had no doubt the system now brought forward possessed advantages in respect of the working of underground railways, especially in avoiding the nuisance arising from the vapours of combustion from the locomotive engine, and it would save much of the great wear and tear of permanent way caused by the locomotive itself; but, it seemed to him, when they had got so far all the advantages of the proposed system were at an end. He did not know whether Mr. Barlow had proposed to adapt the railway to the system or the system to existing railways. If it was proposed to adapt this system to the Metropolitan Railway, he would apply it to the case of the King's-cross and Gower-street section on that line. The distance between those two stations was 50 chains, or five-eighths of a mile, with a gradient of 1 in 100, or a total rise of 33 feet. A train to arrive at Gower-street from King's-cross must, upon the proposed system, start with a velocity at least equal to that which a body would acquire in falling from a height of 33 feet. This would be expended in overcoming gravity only, but they had also to overcome the friction and the resistance of the atmosphere. Instead of the sum of these resistances being only 15 lbs. to the ton he believed the experiments made on the Metropolitan Railway showed that the resistance at the moderate speed employed on that line was something like 25 lbs. per ton. He would take $22\frac{4}{10}$ lbs. per ton as a convenient figure. Thus, in order to get over the gravity and other resistances over that distance, the train must start at a velocity equal to that of a body falling from twice 33 feet, or 66 feet. But it would not do to run into Gower-street station by the simple exhaustion of the momentum of the train. It should have a terminal velocity of at least 15 miles an hour to be extinguished by the brakes. In order to do that, the falling body assumed would have to fall from an additional height of $7\frac{1}{2}$ feet; therefore the train must be started with a velocity equal to that of a body falling $73\frac{1}{2}$ feet in order to arrive at the intended point on that gradient. The velocity required would be something like 70 feet per second, 66 feet per second being equal to 45 miles an hour, and that would hardly be a proper rate at which to start in order to get over the short distance between those two stations. The question was whether it would be safe or prudent to start at that speed. Would the carriages bear the great strain necessary to produce it? Would they keep the rails? Then, again, the whole of the power applied to the train was to be expended within a distance of 300 feet. A train of 40 tons weight was assumed, but this he believed was but about half the maximum weight of the trains on the Metropolitan railway, irrespective of the engine. To give a train of even 40 tons a velocity of 66 feet per second, starting up this incline, would require the exertion of about 6,300,000 foot lbs. of mechanical power, which had to be put into the train in a distance of only 300 feet, so that the constant force must be equal to 21,000 lbs., or nearly three times the maximum power of the engines now employed on the Metropolitan railway.

Mr. BARLOW said the speaker was arguing upon entirely wrong premises.

Mr. COLBURN inquired within what distance the power was to be applied?

Mr. BARLOW replied 242 yards.

Mr. COLBURN added, that brought the rate down in the proportion of 726 to 300; but his argument was merely to illustrate the case of 300 feet, which had been mentioned. It would be a most rapid acceleration of speed even if the distance were twice and a-half what he had first supposed to be intended. The power was applied very suddenly, and the starting must be at the rate of 45 miles an hour to do the distance between those two stations, and he did not think either the carriages or the line could stand that, even if it were not productive of great inconvenience to the passengers themselves. Besides, he had heard no mode suggested by which that velocity could be obtained within so short a distance, nor did he yet see how the power was to be connected with the train without causing violent shocks. On these points he should be happy to hear Mr. Barlow's explanations.

Mr. SEYMOUR TEULON would feel obliged if Mr. Barlow would explain the manner in which he proposed to connect the rope with the train for so short a distance, and also how he proposed to disconnect it.

Mr. BARLOW replied that the length of the rope depended upon the gradient to be worked. If the gradient were 1 in 100 it would require a greater length of rope, and the steeper the gradient the more advantageous was this system. The mode of detachment from the rope was precisely that adopted on railways at the present time, viz., by means of a pin.

Mr. T. MARR JOHNSON thought Mr. Barlow had lost sight of the extreme inconvenience of fixed plant. It was the great difficulty which attached to the atmospheric and the pneumatic systems. Let them imagine the inconvenience of a break-down of the engine. Mr. Barlow said there were eight hours of the twenty-four left for repairs: but on the Metropolitan Railway there were only four hours. In case of a break-down Mr. Barlow had said there would be a pilot engine to get over the temporary difficulty, but this could not work the traffic. If there occurred a break-down of the engine or rope, the chances were it would take a week to repair; and even with plant in duplicate it might take a day. If the traffic of the Metropolitan line were stopped for a day, 30,000 people would be prevented from travelling over it, which would ultimately have considerable effect upon the dividends of the shareholders. It was absolutely necessary, not only that the trains should run with great frequency, but that they should also run with the greatest certainty, or travellers would be deterred from using the line. Another consideration with respect to the adoption of this system to the Metropolitan line was the fact that that line was worked in connection with the Great Western and the Great Northern railways. The trains of those lines could not possibly be worked partly by locomotive and partly by rope traction. Locomotives must work the long traffic, and might therefore as well bring the train on to Farringdon-street. The truth was, moreover, that in order to get over the difficulty of a break-down of the machinery, it would be necessary to keep eight or ten locomotives in stock.

Mr. BURNETT said that the tractive force required to propel the trains on the Metropolitan Railway up the incline of 1 in 100 between King's-cross and Gower-street was 6,900 lbs. for a train of 70 tons. Deducting the weight of the locomotive, which might be assumed as

one-third that of the whole train, the force required would then be two-thirds of the 6,900 lbs.

Mr. THOS. WEBSTER, F.R.S., said the subject before them was one of much interest, and they must all feel indebted to Mr. Barlow for having brought forward a proposal having for its object to obviate what was, no doubt, a great difficulty in the working of a railway like the Metropolitan. All engineers, he believed, had come to the opinion that it was desirable, if possible, that some other system of working these lines should be adopted. The locomotive engine was no doubt one of the most perfect machines ever invented, and the amount of work it was capable of doing was astonishing; but when they considered it was adapted, in the first instance, to the working of long lines, carrying enormous weights, with few stoppages as compared with the metropolitan system, which involved a great number of stoppages, the time he thought had arrived when they should endeavour to provide some other means of propulsion on the metropolitan system, which was being so rapidly extended, particularly as in long tunnels the foul air from the locomotive was a serious nuisance. At the same time it could not be denied that, as was stated by Mr. Johnson, the difficulties in introducing either the rope, the atmospheric, or the pneumatic system on such a line as the Metropolitan were very great; but he thought it was no answer to the proposition before them, to say there were difficulties in the way of its adoption. They must look at the whole question, because he thought there was a strong feeling on the part of the public, and of many engineers, that the whole system of working these metropolitan lines must be reconsidered. If that were so, although they must admire the great skill with which the Metropolitan railway was worked, he thought a proposition coming from a man of Mr. Barlow's practical experience ought to be received with the greatest consideration. The atmospheric principle, judging from former experiences of it, he apprehended was quite out of the question, and the pneumatic system was as yet almost untried. The question was a most important one, and Mr. Barlow having brought it before them—not as an amateur—not as a mere adventurer, but as one who had had a vast amount of experience in the working of railways, he hoped it would receive, as it deserved to do, most careful attention.

Mr. CHAS. VIGNOLES, F.R.S., believed that theoretically and mathemetically Mr. Barlow's calculations were accurate. He would say with regard to what had fallen from Mr. Johnson, that the difficulties attending the break down of the stationary machinery were not much to be apprehended. Both the atmospheric and rope systems had worked for many years without any failures from the breaking down of the engine. He thought as far as the ordinary practical working of a line was concerned, the stability of fixed engines as they were now made might be entirely depended upon, particularly if duplicates were supplied where necessary; but with these admissions he was not prepared to say that the system of working metropolitan lines by stationary rather than by locomotive power, had arrived at that degree of ripeness that they could adopt it. The atmospheric system was worked for many years with some failures, but the truth was it did not pay from a variety of causes. He was not aware of the precise reason why the rope on the Blackwall line was abandoned; but he could quite understand that on a line perfectly open a comparison between the locomotive system and stationary engines would be very much in favour of the former. But, now they had railways under ground, there were a variety of circumstances, chemical, sanitary, and otherwise, which altered the nature of the case very materially. He quite agreed with Mr. Webster that the time had come when they should seriously discuss the desirability of working these metropolitan lines by other means than the locomotives now in use. He was not prepared to say Mr. Barlow's system was the best. He thought that gentleman had underrated the power of resistance, though perhaps Mr. Colburn had overrated it, and therefore he thought the motive power calculated on by Mr. Barlow was too low; but in his opinion sufficient had been said to show that the stationary system was worthy of trial. He apprehended it would be difficult to get that trial, owing to the great expense it would involve, and he did not think an experiment on a small scale would be successful. With all Mr. Barlow's mathematical talent he thought the system was hardly ripe enough to be brought into practical operation, though he felt indebted to him for having brought the subject forward.

Dr. BACHHOFFNER remarked that the sanitary question, in connection with underground railways, owing to the nuisance in tunnels arising from the vapours of combustion from the locomotive, was a very important one. He expressed his surprise that during the discussion no allusion had been made to the description of locomotive which he understood had been modified by Mr. Fowler to such an extent, that it gave out no vapour whatever during the passage through a tunnel. In fact, it was a gigantic tea-urn, with a heater inside of sufficient capacity to keep up the steam, while passing through a tunnel, without any products of combustion escaping from the furnace. He was not aware whether that kind of engine was generally employed on the Metropolitan Railway. As far as he gathered of the mode of attachment of the train, it appeared to him that both in the attachment to, and detachment from, the rope, a very sudden jerk to the passengers must be occasioned.

Mr. S. TEULON said when he asked the question as to the mode of attaching the carriages to the rope, he did so as one materially affecting every system of rope traction where the rope was not continued from one terminus of the line to the other. He believed the rope on the Blackwall line was abandoned in consequence of its connection with other lines, worked by locomotives, rendering that system inconvenient. He fully agreed with the opinions expressed by Mr. Webster and other speakers that, where a railway consisted mainly of tunnels some other mode of traction than the locomotive should, if possible, be adopted; but he doubted whether in practice it would be desirable to have a series of either weights or stationary engines, because there would be a difficulty of detachment as the carriages arrived at each station. It was stated in the paper that with frequent stations on a metropolitan line, worked by locomotives, a journey could be accomplished quicker in a cab with a good horse than by the railway, and he should be glad to hear whether, under the system proposed, the journey by railway would be expedited. He apprehended that unless the train was started at greater speed by this system than by the locomotive they would be in the same position in that respect as they were now. With regard to the jerk at starting, they all knew that if the driver turned on the steam too quickly at first an effect not pleasant to the passengers was produced. Although a system of rope traction might be a very good one where the stations were close together, and where all the carriages were attached to the same power, so that they could not have one carriage overtaking another, they must remember that on all the metropolitan lines they had to provide for the arrival of locomotives from long distances on other lines; because he did not understand that the rope system was proposed to be adopted throughout the country. He had much desired to call the attention of Mr. Barlow to difficulties which at present he had not shown how he could overcome.

Mr. R. K. BOWLEY begged to remind the meeting that Rammell's Pneumatic Tube had been at work regularly for a long time at the Crystal Palace without interruption or accident. He would not give any opinion on its merits, but would merely state this fact for the information of the meeting.

Mr. CHUBB, having been connected with the management of a metropolitan line for the last ten years, would

say it struck him that the suggestions of Mr. Barlow amounted to a return to a system which he regarded as altogether exploded. The rope traction on the Blackwall Railway was an utter failure. Mr. Robert Stephenson stuck to his child till he could endure the creature no longer. It was not only ruinous to the traffic, but the cost to work that traffic with anything like regularity was enormous. It was not abandoned, however, on account of the difficulty of junction with other lines, for it was quite practicable to effect this by covering over the rope at the points of junction. The rope, however, was perpetually breaking, and horses had to be kept ready to bring it home after the difficulty of catching the broken ends had been accomplished. The introduction of the rope system on that line had caused an addition to the capital of the company of not less than £100,000; and, after every possible material for the rope had been tried, all of which failed, it was happily abandoned for the system of locomotive traction. He considered the motive power ought to accompany the train, and he believed the right thing to do was to deal with the locomotive itself, and endeavour to modify its construction so as to meet the requirements of the new system of railways that had been commenced, but he earnestly begged them not to return to the rope system.

Mr. BURNETT thought the alleged deterioration of the atmosphere in the tunnels of the Metropolitan railway had been much exaggerated. He referred to the fact of the enormous traffic which was daily carried on that line, as a proof that it was not viewed with disfavour by the public, and remarked that if the engines which ran from the lines in connection with the Metropolitan were as free from the vapours of combustion as were those employed by the company, there would be no cause of complaint on that account. With reference to the alleged vitiated atmosphere in the tunnel stations, he would state that fans were introduced to bring down the good air from above, and drive off the bad air from below; but after they had been a little time in operation the officials begged they might be removed, as it was questioned whether the air brought down was not worse than that which existed in the tunnel.

Mr. JOSEPH SMITH remarked that the fact was lost sight of that the journey from Bishop's-road to Farringdon-street was accomplished in eighteen minutes, which was a very short time to pass in even a confined atmosphere. He should be sorry to be left in one of the tunnels of the Metropolitan line as he had often been on the Blackwall through the failure of the rope system.

The CHAIRMAN said it now became his duty to ask the meeting to accede to a vote of thanks to Mr. Barlow for the interesting paper with which he had favoured them on a subject which was exceedingly important, not only to engineers, but to all who travelled by railways, especially on the metropolitan lines. It appeared that Mr. Barlow had brought before them a system, novel in many respects, though not essentially so. Mr. Barlow had told them that on a line where the stations were very frequent, they might with advantage employ a means of propulsion that was not available where the stations were more distant apart, and where the length of rope required would be exceedingly great, and had maintained that, by employing fixed engines and using rope for short distances, there would be a great saving of engine power, and reduced expenditure in the general working of the line. He had also shown that by taking advantage of accumulated momentum, an economy of power and an increase of speed could be obtained, but he had omitted to notice the important consideration of securing a much purer atmosphere within the tunnel. They must recollect that, in the construction of lines for which the sanction of Parliament had already been obtained, tunnels of greater length than anything they had on the Metropolitan would occur. This would be the case on the line from Victoria-street, under the Thames embankment, to Blackfriars, and also on the proposed East London line, of which the Thames tunnel was to form a portion, and these being at much greater depth from the surface rendered the question of purity of atmosphere a still more important one. It was one of those engineering problems which should meet with full and careful consideration. It was satisfactory to find the calculations of Mr. Barlow supported by two able mathematicians, Mr. Imray and Mr. Vignoles. They were told that a great objection to fixed as compared with locomotive plant was the liability of derangement in the machinery, but this fear was originally expressed with regard to steamers, and yet those who had taken long sea voyages must have been struck with the undisturbed regularity with which the engines of steam vessels were worked almost without cessation for weeks together, which was sufficient, he thought, to dissipate all fears in connection with derangement of machinery. With regard to casualties, it should not be forgotten that it was proposed to have duplicate engines and therefore the chances of a serious break down in working this system were very trifling. He apprehended the purpose of this discussion was to ascertain the real merits of this system, for it must be remembered that we had to deal with what might be termed an entirely new class of railways, and therefore some improvement in the present mode of working seemed to be required. He confessed he hoped this was only one of many discussions which they would have in this room by which they might find a better mode of travelling underground than any hitherto adopted. Mr. Johnson argued from the large number of persons who travelled on the Metropolitan railway, that the system was as good as it could be, but if a better system were introduced he (the Chairman) contended more people might be induced to use the line. He concluded by moving a vote of thanks to Mr. Barlow for his paper, which was carried unanimously.

Mr. BARLOW, in acknowledging the compliment, said he would endeavour to answer the objections that had been brought against this system of propulsion. With reference to the Metropolitan Railway, he had said very little about that line in particular, but he had said he thought locomotives were generally very cruelly treated on lines with frequent stations, and on the Metropolitan line that cruelty was carried to the greatest extent, inasmuch as the locomotive was prevented from breathing whilst going through a tunnel, in order that the passengers themselves might be able to breathe. With regard to the figures given by Mr. Colburn about traction, he thought that gentleman must have mixed up those figures with something in which he had been engaged on the other side of the Atlantic, as they had nothing in this country in the way of traction that agreed with his statements. With respect to what had fallen from Mr. Chubb relative to the system of rope traction formerly employed on the Blackwall line, it was no argument that because a thing had failed under certain conditions, it should not succeed under entirely different conditions. He (Mr. Barlow) had had very considerable experience in rope traction, and he was acquainted with all the difficulties connected with it. He was aware of the loss of mechanical power which was occasioned by the rope; but in the case of the Blackwall railway the great wonder was that it ever worked at all. It was a rope more than three miles long; and the difficulty of working a rope increased by more than the square of the length; so that it was no argument to say that because a rope of three miles failed, therefore a rope of three hundred yards could not succeed. With regard to the starting of the train, it had been objected that under the rope system there would be an unpleasant jerk, but this was not so much the case as under the present system, for with locomotives the couplings of the trains were frequently slackened when it was standing at a station, and the result was, when they put on the steam each carriage received a jerk at starting. He had been assured by Sir William Armstrong and other eminent practical men

whom he had consulted on this subject, that under this system a train could be started more gently than by a locomotive. The rate of speed at which it was proposed that the train should be started, was not necessarily higher than under the present system with a locomotive on a descending gradient. Moreover, if by the rope system they could make the uphill start and travelling as good as the downhill at present, they would effect a material improvement. Besides, when it was considered that under this plan of propulsion trains could be run every three minutes, they would not have such heavy trains to deal with as at present. On the subject of rope traction he would say, further, he believed he was the first to abandon it on the Whitstable branch, and the example was followed on several other lines, including the Glasgow; but, in the latter instance, they were obliged to come back to the rope again; and for a distance of nearly a mile and a quarter a large passenger traffic was carried on by rope traction at the present time, and hence it could not be contended that any practical difficulty would arise with a rope of 300 yards. Objection had been made to the rope system on the ground that it interfered with junctions; but the proposed mode of applying the rope traction for short distances entirely obviated this difficulty.

DUBLIN INTERNATIONAL EXHIBITION, 1865.

Austria is making strenuous efforts to be well represented at the Dublin Exhibition, and it is to be hoped that the new commercial treaty which is now being negociated with that empire will tend to a largely extended trade on both sides, when the existing fetters to commerce are removed. Austrian manufacturers did exceedingly well at the London International Exhibition in 1862, for, besides gaining great honour, extensive sales were effected. Already it is said that Chevalier de Wertheim and Co., the celebrated workers in metal, will have a very fine display, with photographs of their works; and that Neustadt, of Prague, will send works in the precious metals. The porcelain by Fischer, which attracted so much notice in 1862, will be well represented. C. Kronig, of Vienna, will exhibit papier-mache furniture, in addition to objects in carton pierre, and fancy articles in wood. Messrs. Thonet Brothers exhibit bent wood furniture, for which they received a medal in 1862. M. Klein will send a magnificent collection of leather work, rivalling the one exhibited under the western dome in 1862. Meerschaum pipes and amber carvings will be shown, and there will also be a good collection from Austria of musical instruments, glass, clocks, oil paintings, photographs, and photographic apparatus, wines, and agricultural produce.

NORTH LONDON WORKING CLASSES INDUSTRIAL EXHIBITION.

The distribution of prizes awarded to the successful exhibitors at this Exhibition, held at the Agricultural Hall, Islington, took place on Monday evening, the 16th instant, at Exeter Hall. The Right Hon. the Earl of SHAFTESBURY, K.G., occupied the chair. A tonic-sol-fa choir, under the direction of Mr. Sarl, sang several pieces of sacred music.

The meeting was briefly addressed by Mr. T. B. SMITHIES, Mr. SAMUEL MORLEY, and Deputy-Judge PAYNE.

The list of successful exhibitors, with the names of the prize volume or article awarded to them, was then read, and the recipients, passing along the front of the platform, received from the hands of the Chairman the prizes they had gained.

The Earl of SHAFTESBURY said, in reference to the prizes, that never were rewards more honourably won. The working men had come forward generally to show what their class was capable of—what high aspirations and great powers they possessed, if only opportunities were afforded for their development. Such manifestations would not only be of benefit to the working classes themselves, but also of great and lasting benefit to the whole of the British empire. On behalf of the public, he would say that the public came forward to thank the working men in the same spirit in which they had contributed to the happiness of the whole British people. A remarkable feature of the Exhibition, and of that which preceded it, was the large proportion of works wrought by men not producing articles in their own department of industry—persons of different capacities had produced results of a character totally different to the trade in which they were engaged. The conclusion he drew from the Exhibition showed the necessity of a variety of occupations, and the earnest desire and craving for mental recreation amongst the great working class. Let the evening of the working man be devoted to the exercise of his genius, and to everything which could improve him morally and raise him in the social and political scale. He regretted to hear it suggested, with some degree of authority, that in all future Exhibitions of this kind—and he trusted they would be many—all exhibitors should be confined to the particular department of industry in which they were daily engaged. This would be undesirable. The object of such exhibitions was social rather than financial, and moral rather than commercial, for it was to hold out a healthy, joyous, and noble recreation to the working classes—to break and embellish the monotony of toil—to give a free safety-valve to genius and taste, and to that which, if not rightly indulged, would be hurtfully indulged, namely, the power of the imagination. Such exhibitions tended to improve the conditions of social life, give dignity to domestic life, and throw over home all the allurements possible—to induce working men to give up the habits by which so many were degraded, and by the cultivation of their genius and the exercise of the affections, to make the family-hearth happy.

Mr. W. H. BODKIN (Assistant-Judge) proposed, and Mr. HARVEY seconded, a vote of thanks to the noble chairman, which was carried by acclamation.

PROTECTION TO INVENTORS IN INDUSTRIAL EXHIBITIONS.

On Tuesday, the 17th inst., a deputation on this subject was received by the Right Hon. M. Gibson, President of the Board of Trade. The request for an interview originally came from the committee of the West London, late Borough of Marylebone, Working Men's Industrial Exhibition; but, at their invitation, gentlemen connected with other similar exhibitions joined the deputation. Among those present were—Mr. R. M. Morrell, secretary to the West London Exhibition; Mr. Murphy, South London Exhibition; Mr. Ratley, one of the honorary secretaries to the North London Exhibition; Mr. G. J. Knight, East London Exhibition; Mr. Christie, secretary to an Exhibition to be opened at Birmingham in August; the Rev. Eardley Wilmot, Mr. J. A. Nicholay, Mr. Peter Graham, &c.

Mr. Harvey Lewis, M.P., introduced the deputation.

Mr. MORRELL said there had hitherto been no system of communication between different districts with respect to these industrial exhibitions, but he now found that in every district the same difficulty had been experienced as that which the promoters of the West London Exhibition had to contend with. They were asked at the very outset whether they could afford protection to inventors who might exhibit, but who were too poor to obtain a patent, and who, by exhibiting without that security, might find themselves robbed of the fruits of their ingenuity and labour. Of course they were most desirous of affording such protection on the simple ground of justice, as well as expediency, for they soon found that unless such protection was given, the most valuable inventions of working men would be entirely withheld. The subject had been so strongly brought before them at many meetings, tha they felt compelled to move in the matter, and, as a result

of their exertions, the Right Hon. Mr. Cowper, First Commissioner of Works, and Sir Roundell Palmer had both taken the subject up. It was, indeed, by the recommendation of the Attorney-General that they waited upon the right hon. gentleman in his official capacity, to ask him to introduce a short bill into Parliament for the purpose. The Attorney-General had stated his willingness to assist in the preparation of such a bill, and to take charge of it if it had the sanction of the Government. He urged upon the right hon. gentleman that there could be little difficulty in acceding to this request. That protection had been accorded to the inventors who exhibited at the Great Exhibitions of 1851 and 1862, and surely there could be no objection to do the same for the industrial exhibitions that were now springing up all over the country. He did not apprehend that on public grounds there would be any objection to such a measure, and he was sure that it would bring out hundreds of working class exhibitors who would otherwise withhold their inventions.

Mr. CHRISTIE, of Birmingham, Mr. MURPHY, of the South London Exhibition, and other gentlemen urged the importance of the measure.

Mr. NICHOLAY expressed his confident expectation that the Government would accede to the request of the deputation, and give to the poorer classes of inventors the same protection as they had given to wealthy inventors at the Great Exhibitions.

Mr. M. GIBSON said that if he understood the deputation clearly their immediate object was to get some bill brought in which would prevent any working man exhibiting at those exhibitions being prejudiced by such exhibition, or deprived of the fruits of his toil and ingenuity. That he understood to be their immediate object, and it was a very simple one. But there was one point to consider. How would they define which of these exhibitions was to have the benefit of the protection they asked for? In the case of the Exhibition of 1862, and the act they referred to, the matter was very simple, because that Exhibition was under the control of a special commission, and could, therefore, be specifically referred to. The difficulty in this case would be to find some title which was sufficiently general to cover the whole ground, and at the same time not go beyond the real object aimed at. He would be most happy to give the matter his best consideration, and should the Government sanction it, he had no doubt the Attorney-General would give his assistance, and take charge of any bill that might be introduced.

Mr. PETER GRAHAM suggested that a certificate from the Board of Trade would be a sufficient warrant for putting the provision of a general act in operation.

Fine Arts.

A MEDALLION of the Poet Laureate is now being published by Mr. Moxon, the publisher, which may possibly run through as many copies as the poems, that are perhaps scarcely more the exponents of the great poet's mind than is this medallion the reflex of his mind-moulded features. The likeness is more striking than ordinary medallion-likenesses are, not only from the extreme accuracy with which the work is executed, but on account of this medallion (unlike most medallions) being taken in "three-quarters" instead of in "profile." There is, moreover, great "relief" gained by the employment of a concave ground, which not only negatives the possibility of these cast-shadows that disfigure most medallions (and give them the appearance of "a split-jowl" adapted by its cut-surface to a flat ground), but, at the same time, allows of a very considerable amount of side light, much more than is obtainable in profile medallions. It is intended that this likeness of Tennyson be produced at a very reasonable price, both in electro-bronze and in plaster of Paris, and Mr. Woolner, the sculptor, and friend of Tennyson, has entrusted the entire management of this novel undertaking to the judgment of Mr. Moxon.

Commerce.

TEA SUPPLIES.—The following is from Messrs. Lloyd, Matheson and Co.'s annual statement:—The total imports to the United Kingdom amount to 122,600,000 lbs., against 136,000,000 lbs. in 1863. The total deliveries are 116,100,000 lbs., against 112,100,000 lbs., of which the home consumption is 88,200,000 lbs., against 85,000,000 lbs.; and the foreign export is 27,900,000 lbs., against 27,100,000 lbs. in 1863. The total stock in the United Kingdom on 31st December was estimated at 95,200,000 lbs., against 88,700,000 lbs. in 1863. The imports to Liverpool, direct from China and Japan, for 1864 are only 1,600,000 lbs. It is gratifying to observe a steady increase in the home consumption, which, though perhaps not fully up to the sanguine expectations of some, is fully 10 million lbs. increase on the figures before the reduction of the duty to 1s. per lb. The foreign export also appears steadily on the increase, at least as regards the continent of Europe; for notwithstanding the much diminished sendings to America during last year, the total exceeds the figures of the preceding year. With all the increase, however, the total deliveries do not come up to the liberal supplies which have reached this country from all quarters. From China and Japan we have received 116 million lbs., while India has sent about three million lbs.; and these, with occasional supplies from America and other countries, bring the excess of imports over deliveries to quite six million lbs. It is now evident that the reduction of duty has had the effect of stimulating the consumption of good to fine grades in each description of tea. These grades throughout the year have not been oversupplied; and, generally speaking, teas with quality have been readily saleable on arrival, not always at prices remunerative to importers, but at rates which were not materially below the average prices of similar grades in former years. We may here remark that while the demand has been stimulated for the the finer qualities, the production in China appears to have deteriorated. The proximity to the producing districts at Hankow has evidently caused a rapid and careless preparation of the blackish leaf teas, but from one cause or another the quality of most of last year's, and so far of this, shows a decided falling off; there is a want of ripeness and evenness of quality in the chops, and the leaf is ragged and badly picked. The Foochow teas are not so much fallen off, as this season's fine show a decided improvement in real quality over last, if we except the Packlin sorts; but the lower grades of the first crop are decidely inferior. What is most to be regretted in connection with this depreciation in quality is, that buyers in China appear, in the majority of cases, to have paid for these teas as if they had been really fine, hence, both last year and this, differences of 4d. and 6d. per lb. were not unfrequent, not arising from a depreciation in the home market, but solely from the mistaken view of the quality abroad—as if tea was bought by its class, instead of by its intrinsic quality.

INDIAN AND JAPAN TEAS.—Messrs. Arthur Capel and Co., in their circular, state:—"Indian teas continue to be in great favour with the trade, owing to the general inferiority of the China crops; and the fine, strong, pungent kinds have sold dearer than ever; whilst the common, weak, and sour kinds have been generally difficult of sale, not being good enough for the purposes of admixture, for which they are mostly used. It is quite evident that if proper care in the cultivation and curing of Indian tea is taken, the result will prove a great success to all interested, as it only requires the superior strength and quality to be maintained to insure a ready sale at remunerative prices. Japan teas, as long as the demand

from America lasted, sold very readily at full prices, but they do not meet with favour from the home trade; and since the export to America has ceased they have been very difficult of sale. We fear that unless they can be made to assimilate more to China teas, either black or green, they will be always uncertain of sale, as they are entirely dependent on the American demand, which in the present position of affairs is liable to great fluctuations. The coloured kinds early in the year realised extreme prices."

THE EARTHENWARE TRADE WITH THE UNITED STATES.—Mr. T. H. Masters, of Liverpool, states that the annexed report shows at a glance how the earthenware trade with the United States has been going on during the war there, compared with the preceding years 1859 and 1860, which represent the usual extent of exports in ordinary times. The excessive falling off in 1861 may be ascribed to the ample stocks held by merchants and dealers at the beginning of that year (the first of the war) as compared with the demand which was looked for during the remainder of it, and also to the financial confusion which was expected to arise immediately upon the commencement of hostilities between the North and South. The exports of last year figure very satisfactorily when it is borne in mind that American importers have been surrounded by every species of impediment. The uncertainty which hung over the presidential election materially checked shipments during the latter part of the year, but recent advices indicate the prospect of a fair amount of business during 1865, unless some unforeseen events occur to prevent it. The following is a comparative statement of exports of earthenware from Liverpool to the six principal ports of the United States during the past six years:—

	1859.	1860.	1861.	1862.	1863.	1864.
To	Pkgs.	Pkgs.	Pkgs.	Pkgs.	Pkgs.	Pkgs.
New York...	43,217	43,920	15,649	30,495	33,434	37,143
Philadelphia	13,390	13,780	5,089	10,762	10,354	12,147
Boston	16,599	18,955	7,024	8,747	10,283	12,550
Baltimore ...	2,194	2,107	340	869	243	587
Charleston...	3,020	2,188	158	...	...	...
New Orleans	15,811	14,510	1,494	...	771	594
Totals...	94,231	95,460	29,754	50,873	55,085	63,021

In January, 1859, exchange at New York for bankers' bills on London was 106, and the Bank of England minimum was 2½ per cent. In the last week of 1864, exchange at New York for bank bills on London was 238.

TELEGRAPHIC EXTENSION AND REFORM.—Very great progress has of late been made in this important matter on the continent. The French Government has just placed the electro-semaphoric posts on the coast in connection with the general telegraphic system, so that messages may now be despatched and received at these outposts in the same manner as in the towns. The *Moniteur* has just published a complete list of these semaphores and of the more important places situated within the vicinage of each. Another very important announcement has just appeared in the same journal, containing the results of recent conventions made between France and foreign governments. According to the new arrangements the cost of a message between any of the offices of France and the Papal States is now 5 francs for twenty words, and half that sum for each additional ten words; between France and Prussia, east of the Weser and Werra, 4 francs and 2 francs; between France and the Rhenish Provinces, and also between the former and Baden, 3 francs and 1½ franc. The importance of these conventions will be best understood by a few instances. A message between Paris and Rome will cost 5 francs instead of 13fr. 50c.; one between Paris and Cologne, 3 francs instead of 7fr. 50c; between Paris and Berlin, 4 francs instead of 12 francs; between Marseilles and Dantzic, 4 francs instead of 15 francs; between Bordeaux and Memel, 4 francs in place of 18 francs; and between Toulouse and Carlsruhe, 3 instead of 9 francs.

THE COFFEE TRADE.—Messrs. Truman and Rouse, in their circular, state the stock of coffee in the principal entrepôts in Europe and Great Britain, on the 30th November, was 53,170 tons against 59,750 and 49,930 in 1863 and 1862. The deliveries in Holland continue satisfactory, being for the past year 890,400 bags against 725,700 in 1863, and the consumption in Europe generally appears to be fully up to that of last year. Looking forward to the prospects of coffee in 1865, there is every reason to anticipate a steady trade, and the continuance of remunerative prices to the planters in Ceylon and Madras, although, regarding the fact that both these countries will yield a considerably greater supply, it would be scarcely safe to reckon on so high a range of quotations as those of 1864. The shortness of the Java crop will, however, help us, as the demand for clean coffee on the Continent is evidently increasing. As respects Brazil the prospects are not so encouraging; the new crop will undoubtedly be large, and unless the consumption in America increases, the supply will probably be found somewhat too heavy for the European markets. The home consumption in Great Britain last year was but 16,530 tons, being 670 tons below the average of the previous two years. The increased use of coffee does not keep pace with that of tea in England.

CEYLON COFFEE PRODUCTION.—The following returns of the Ceylon Coffee Crops are extracted from the *Colombo Observer*:—Although the crop for season 1863–4 was very much smaller than that of 1862–3, yet, with that exception, it was the largest known:—

Total Crops of Coffee in Ceylon to the end of the Season (30th September) in the last Five Years.

YEARS.	PLANTATION.	NATIVE.	TOTAL.
	Cwts.	Cwts.	Cwts.
1860	472,618	160,241	632,859
1861	466,987	136,190	603,177
1862	414,298	170,824	585,122
1863	582,528	204,973	787,501
1864	516,862	137,949	654,811
Total for Five Years..	2,453,293	810,177	3,263,470

The whole crop may now be said practically to have been shipped to London . . . This is rather a change since 1859–60, when out of a crop of 632,000 cwts., 130,000 went to countries other than England . . . If the figures received from Java and Brazil can be depended on, the out-turn of crop 1863–4 in the three great coffee countries of the world is as follows:—

	1863–4.
Brazils	2,800,000 cwts.
Java	795,000 ,,
Ceylon	654,000 ,,
Total	4,249,000 cwts.

Coffee cultivation is rapidly extending in Ceylon . . . As a probable out-turn of 900,000 cwts. of coffee is admitted for the season 1864–5, going on all former experience it seems pretty certain that the annual million will be made up or exceeded for the next five years. Indeed, it would not be extravagant to anticipate an export of two millions in 1870.

WINES.—Messrs. M. Clark and Sons, in their Annual Circular, state that the trade in wines and spirits, which has gradually progressed since the reduction of duty, has made a most marked and decided step in the past year, and while the imports have been somewhat excessive, and leave a heavy stock on hand at the present time, still the home consumption shows so great an increase as to justify the conclusion that the bonded stock is but little above the requirements of dealers, and may speedily be reduced, if importations are moderate, by the deliveries during the next two months. The past year has been the largest in imports and deliveries that we have yet had, and compared with the average rate of delivery under the

old scale of duties, the home consumption of wine shows an increase of fully 66 per cent. This increase is the more remarkable, as it has been maintained throughout the year, in the face of monetary pressure and commercial disaster, added to the fact that prices of several descriptions of wines have ranged considerably higher than formerly.

Colonies.

SUGAR IN QUEENSLAND.—A very excellent sample of sugar has been shown, produced at the plantation of the Hon. Lorys Hope Cleveland. It is a portion of three tons of dry sugar and fifteen hundredweight of molasses, the produce of less than one acre of purple cane. Some inquiries have been made respecting the market value of this class of sugar, which is variously estimated at from £38 to £41 per ton. Mr. Strachan, the manager of the plantation, states that the canes from which it has been produced are the first that have been fully ripened, and that have had a fair trial given them since the formation of the plantation, and that he anticipates a much larger yield from future crops, as he intends to plough much deeper. He also states that at a small additional expense he believes that the sugar can be further refined, and rendered much more valuable. It is very gratifying to see so good a result of the work at the Cleveland station, and is a subject for much congratulation to Capt. Hope, It is also a matter of congratulation to the entire colony, as it must establish, even in the mind of the most sceptical, the sugar-growing capabilities of Queensland.

RAILWAYS IN NEW SOUTH WALES.—Tenders have been called for the Great Southern Extension, which will carry the railway into the town of Goulburn. The length of the line will be twenty-six miles twenty-seven chains, and it is to be let in one contract. There will be a number of heavy cuttings, but the most formidable works will be the bridges across the numerous rivers and creeks. Close to Goulburn there is to be a tubular girder bridge, over the Mulwaree Ponds, with twelve openings of sixty feet. It is not decided whether the piers are to be of stone or brick; prices for both kinds of work are to be given, and that which is found the most economical will be adopted. The line will twice cross the Wollondilly River; the bridge at the first crossing will have seven openings of sixty feet, and one of 130 feet; that at the second crossing will have six openings of sixty feet, and one of 130 feet. At Barber's Creek there will be a bridge with five openings of sixty feet; that at Box's Creek will have two openings of sixty feet. Excepting that at the Mulwaree Ponds, all of hese bridges will have single-web iron girders; the piers to be of stone or brick as may be found most economical. Over several other creeks there will be large viaducts, mostly of timber. The ballasting and the permanent way will be included in the contract, for the performance of which three years will be given.

ALPACAS FOR NEW ZEALAND.—The *Wellington Independent*, of 29th Sept., says—"It is understood that his honour the Superintendent has succeeded in purchasing for this province ten alpacas, eight females and two males, and that they may shortly be expected from Sydney by one of the S. R. M. Company's steamers. This will be a great boon to the province, and as the climate and nature of the country are said to be peculiarly adapted for alpacas, we have no doubt they will thrive well, and that in the course of a few years the wool of the alpaca will form a considerable item in our exports."

Obituary.

IT has been remarked that the past year was a fatal one for artists and men of science on the Continent; certainly the list of the departed is long and melancholy. France has lost from the ranks of art the following eminent painters:—Alaux, member of the Institute, and formerly Director of the French School at Rome; Hippolyte Flandrin; Du Bufe, the elder; Allard, assassinated by one of his models at Rome; Ménissier, killed by a fall from the scaffold on which he was working in the church of Saules; Roehn, Mathieu Rivoulon, Pottin, Barbier, Besson, and Leopold Lobin, director of important stained glass works at Tours; the sculptors, Louis Brian, Aristide Husson, a pupil of David d'Angers, and author of a large amount of busts and decorative sculpture; Christophe Féatin, a clever modeller of animals; and Justin; the architects, Lusson, formerly engaged on public works in Paris, who has left his collection of drawings and plans to the Museum of Mans; Ménager, who won the Grand Prize of Rome at the early age of 18, and executed many public works; Azémar, the designer of some fine mansions in Paris; Boullé, of Rennes; Querry, of Moulins; Segrétain, the restorer of many fine churches in the Department of the Deux Sèvres; Pellegrini, of Chambery, who built the baths and casino of Aix, and whose death is said to have been hastened by the vexation caused by the loss of all his plans, drawings, and sketches, in the fire that consumed the theatre of Chambery; Jules Gagniet, a well-known illustrator; and the engravers, Achille Lefèvre, who exhibited great talent in reproducing the works of Raphael and Coreggio, one of his last productions being an engraving of the "Antiope," ordered for the chalcographic establishment attached to the Louvre; Deschamps, of Marseilles; and Godard, engraver on wood, and conservator of the Museum at Alençon. The French Institut, besides Alaux and Flandrin, mentioned above, lost Ampère, Clapeyron, A. Garnier, Hase, Arnaud-Lefebvre, and Admiral Du Petit Thouars. Amongst savans may be mentioned, Professor A. Cochet, chemist; A. Digot, author of the "Archæological History of Lorraine," twice crowned by the Academy; Dinaux, archæologist; and Savalle, inventor of the well-known apparatus for distillation which bears his name. The following are amongst the most notable names in the obituaries of other countries:—The Marquis Costa de Beauregard, of the Imperial Academy of Savoy, and the Turin Academy of Sciences; Dr. Gerling, Director of the Masbourg Observatory; the Greek savant, Bona; Professor Casper, of Berlin; Franklin Bache, the great grandson of Benjamin Franklin; Peretti, the Roman chemist; Rudolph Wagner; Barnontz de Jassy; Hohenegger, the geographer of the Carpathian mountains; the learned Dane, Charles Rafn; Struve, the Russian astronomer; the traveller Junhung; the Hebrew linguist, Rabin Sachs, of Berlin. Amongst painters, Germany lost R. S. Zimmermann, of Bavaria; Belgium, Gustave Pierron, Henri Julien de Stoop, of the Academy of Brussels, and Charles Robert, killed while hunting; and Switzerland, the celebrated landscape painter Calame, the illustrator of the Upper Alps, famous also for his etchings and lithographs. Belgium has also lost the architects Roeland, Professor at the University and Schools of Art, who built the Palais de Justice, the University, the theatre and casino of Ghent, and an immense number of hospitals, churches, and other public buildings, in various Belgian towns. Rome lost, amongst other artists, Rafaelle Castellini, Director of the Mosaic School attached to the Vatican, and who executed the wonderful works, the "Sybille de Cumes," after Domenichino, and "Saint Jean Baptist," after Guercino, which appeared at the Great Exhibition of 1851, and now are at the Tuileries.

Publications Issued.

A TREATISE ON ORDNANCES AND ARMOUR. By Alexander L. Holley, B.P. (*E. and F. N. Spon.*) This includes descriptions, discussions, and professional opinions concern-

ing the material, fabrication, requirements, capabilities, and endurance of European and American guns for naval, sea-coast, and iron-clad warfare, and their rifling, projectiles, and breech-loading; also results of experiments against armour, from official records, with an appendix referring to gun cotton, hooped guns, etc., etc. There are 493 illustrations.

JOURNAL OF THE PROCEEDINGS OF THE LINNÆAN SOCIETY. Vol. viii., No. 30. (*Longmans.*) Contains the following papers:—The Œsophagus of the Ruminantia, by Wm. Rutherford, M.D. Description of New Species of Hymenopterous Insects, from the Islands of Sumatra, Sola, Gilolo, Salwatty, and New Guinea, collected by Mr. A. R. Wallace; by Mr. Frederick Smith. Account of a Heronry and Breeding-place of other Water Birds in Southern India; by John Shorter, M.D., F.L.S. Brief account of the Myrmica Kirbii, as found in Southern India, by John Shortt, M.D., F.L.S. Description of New Species of the Dipterous Insects of New Guinea; by Francis Walker, F.L.S.

THE LONDON, EDINBURGH, AND DUBLIN PHILOSOPHICAL MAGAZINE. Fourth Series. Vol. 29, No. 193. (*Taylor and Francis.*)—The January number contains articles as follow:—"Researches on the Mineralogy of South America," by David Forbes, F.R.S.; on "The Relative Heating, by Solar Radiation, of the Soil and of the Air, on a Mountain and in a Plain," by M. Charles Martens; on "A Case of Stereoscopic Illusion," by C. J. Monro; note on "A Quartic Surface," by A. Cayley, F.R.S.; on "The Approximate Graphic Measurement of Elliptic and Trochoidal Arcs, and the Construction of a Circular Arc nearly equal to a given Straight Line," by W. J. Macquorn Rankine, F.R.S.; on "Calcescence," by Dr. C. K. Aikin;" on "The History of Negative Fluorescence," by John Tyndall, F.R.S.; note on "The History of Energy," by P. G. Tait, M.A.; on "Thermal Radiation," by Professor Magnus; on "The Work or Potential of Torsion: New Method of Establishing the Equations which regulate the Torsion of Elastic Prisms," by M. de Saint Venant; the proceedings of learned societies, and intelligence and miscellaneous articles.

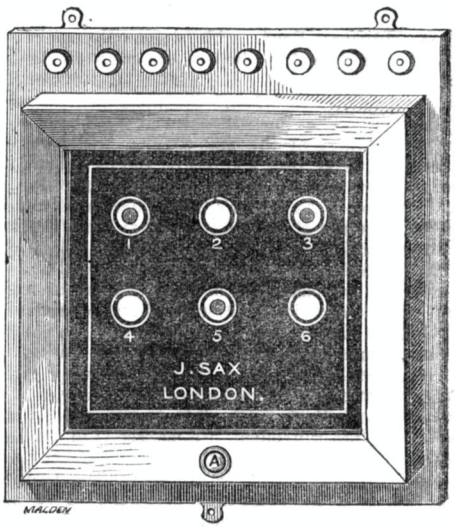
Notes.

THE MEMORIAL TO H.R.H. THE PRINCE CONSORT.—The massive blocks of granite intended for the base and pedestal of the Memorial to His Royal Highness the Prince Consort, have arrived at Limehouse. The blocks are about to be polished at the works of Mr. Kelk, the contractor for the erection of the Memorial, and when that operation is completed they will as speedily as possible be placed in position. So massive and weighty are these blocks in their undressed form that their removal from Limehouse to Hyde-park was an object of considerable mechanical interest. The stone is said to be of singular beauty, compactness, and durability. It is taken from the quarries of the Scottish Granite Company, in the Isle of Mull. It is of a beautiful pink-red colour, capable of a polish equal, if not superior, to the finest marble, while it possesses in abundance all the properties necessary to enable it to resist the chemical action of the atmosphere. In a climate like ours, and for such an object as this National Memorial, the property of resisting the action of the atmosphere is one of supreme importance. Several of the lighthouses on the West coast of Scotland, which have stood the test of innumerable storms and the action of the severest frosts, are constructed of this granite. It has also been used in the construction of various harbours of refuge, in the building of the Liverpool Docks, the harbour works at Greenock, in the foundations of Westminster Bridge, and for the foundations of the Thames Embankment. The monolith or obelisk originally proposed for the Memorial was to have been taken from these very same quarries. The same stone has been selected for the immense red granite columns forming part of the designs of the new bridge at Blackfriars.

CELTIC RELICS.—The Museum of Vienna has just received from M. Karl Zugmayer, of Waldeck, in Austria, an interesting collection of utensils and ornaments, in metal, found in the hollow of a rock, beneath a layer of granite. There seems little doubt that the objects in question are of Celtic origin. Amongst the most remarkable articles are two golden discs, a number of double spirals, arranged in the form of opera glasses, very carefully made, but of which the application is not even guessed at, some bracelets, and two heavy copper hatchets. The discs are respectively about five and six inches in diameter, and weigh together thirty-five golden ducats. They are ornamented with several rows of precious stones. They are believed to be the insignia of chiefs or priests, who wore them on their breasts. Some few years since a number of other precious objects, belonging to the earliest time of the Christian era, were found at Muthmansdorf, a village near which this new discovery was made.

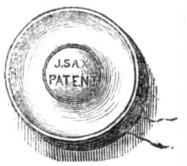
ELECTRIC BELLS AND FIRE INDICATORS.—Some time since an ingenious electric tell-tale, invented by Mr. Sax, was noticed in the Society's *Journal*. He has now perfected an arrangement by which a bell is rung by the electric current, and at the same time a disk is brought to view, showing from which room the signal is sent. It consists essentially of an electric bell, which is placed in a situation where it may be seen by the persons whose attention it is wished to call. Near this is suspended the indicator shown at Figure 1. In the room or rooms from which the messages are to be forwarded, several buttons, represented at Figure 2, are placed against the wall: these correspond in number with the indicator; on pressing one of these buttons with the finger, the bell, however distant, is rung loudly, and a central red disk, as shown at numbers 1, 3, and 5, of the indicator, makes its

FIG. 1.



appearance. It is obvious that if the press buttons are situated in different rooms, the attendants, seeing the numbers marked on the indicator, are at once made aware of the room from whence the signal proceeds. If desired, the whole of the press buttons may be placed in one room, and made to signal different messages; thus, instead of the red disk, the name of the person or article required may be shown at the apertures of the indicator. For example, from the bar of an hotel, the waiter, ostler, boots, or chamber-maid, etc., could be called as required. The bell continues ringing so long as the button is kept down.

FIG. 2.



In addition to the multifarious uses to which this indicator, as thus constructed, could be applied, it may readily be made available as a fire indicator, and this is effected by a modification of the press button shown at Figure 2; this contains a metallic thermometer, which can be set to any temperature desired; and when that degree of heat is exceeded, it makes the contact, completes the electric current, and causes the bell to ring violently so long as the high temperature remains. It thus becomes a fire alarum, ringing its signal of danger from any room or warehouse where it may be placed, to the sleeping apartment of the manager or superintendent. The fire button can also be made to act on a reduction of temperature below any given degree, and if then placed in a hot-house would call the attention of the gardener to the sudden occurrence of a frost, which, if unnoticed, might destroy the results of many months' care and attention.

THE FARMERS' CLUB.—The subjects to be brought forward for discussion during the present year include—"Middle-Class Education," to be proposed by Mr. E. Edmunds, of Rugby; "The Breeding and Management of Pigs," by Mr. S. G. Stearn, of Brandeston, Wickham Market; "The Management of Grass Land," by Professor Coleman; "The Importance of Shelter and Covering to the Farm and the Homestead," by Mr. J. Bailey Denton; "The Management of Benefit Societies in the Rural Districts," by Mr. Charles Howard, of Bedford; and "The Breeding and Management of Cattle," by Mr. T. Duckham, of Baysham Court, Herefordshire. A silver cup, of the value of not less than ten guineas, will be awarded by the Committee for the best paper read during the year.

Correspondence.

ART-WORKMANSHIP. — SIR, — An inspection of the specimens of Art-Workmanship now exhibiting at the Society's Rooms, afforded me great gratification, as showing that in those applications of the Fine Arts which are the most available for domestic adoption, a high tone and completeness of detail is evidenced to such an extent as testifies that we are in a very hopeful state in regard to the branches of the Fine Arts represented at the Exhibition. The wood carvings and the specimens of mosaic work especially attracted my attention, for it struck me that these two branches of art are of such a character that, although for the execution of grand works we must, of course, resort to great masters and expensive materials, yet much that is pleasing and profitable might be produced by the comparatively untutored man of genius; and it occurred to me that it would be very desirable if the Working Men's Exhibitions, which are now springing up around us, were to direct the attention of our working men to the production, from suitable designs, of wood carvings (not in expensive woods) and mosaics worked in cheap materials; moreover, the kindred art of marquetry and inlaid work, as applied to articles of furniture, would most likely be very successfully pursued by our artisans and their families. It would certainly be much more desirable that a man should devote his leisure hours to the production of decorative furniture and ornamental objects for the house than to spend unnumbered years in stitching together small pieces of fabric to form a patchwork bed coverlet, or to the production of things of the ordinary type and character, of an uncouth appearance and unartisan-like finish. In all these branches of art that I have recommended, if we eschew elaborate productions, much may be done with so simple a tool as a sharp penknife or cutting instrument. What is wanted is the publication of suitable designs, with some simple and pertinent directions for the worker; possibly the announcement of some prizes for the best specimens of amateur work would facilitate progress. Even if the works produced by the amateurs should be of little value (though if the effort be sustained they must eventually be of some value), yet the practical acquaintanceship with art which will result must be a public good. It will, at any rate, be adding a new source of pleasure to the people's enjoyments, and eventually be of advantage to our artists, as it will increase the circle of those who consider the acquisition of objects of art as almost things of necessity; and, in any case, amateur workers must find instructive amusement in their work.—I am, &c.,—T. W. CAMPIN.

London, 11th January, 1865.

ART-WORKMANSHIP.—SIR,—I was unable to attend on the 2nd inst. to make a suggestion, and beg most respectfully to do so by letter, viz., that one of the prizes should be for apprentices only, with less work than the present piece of ornament, as the masters generally will not give them any time (Messrs. Hunt and Roskell being a most liberal exception) to compete, and it is taxing their leisure too much to take about three hundred hours from it in six months. This is one of the causes of there being so few; it would also induce many more to try, if they were all youth, the timid would try as well as the more confident. It has been suggested that the selection of subjects should be left to the workman. I think there is very great objection to this, the workman generally not being allowed to design, simply because he is not educated for it, consequently you would have a great deal of trash sent in. On the contrary, while they are selected by you, they are sure to be examples of the highest order, and the study necessary to work them properly will be sure to improve the best workmen's taste, and will ultimately do a deal of good in the working of metal, and, I trust, will answer the noble end you have of improving the Art-Workman.—I am, &c., F. HOLLIDAY.

14, Nailour-street, Islington, Jan. 29, 1865.

ART WORKMANSHIP.—SIR,—This is to add a few observations to those I made at the meeting held at the Society's House on the 2nd instant. I do not think I made myself quite clear about the time allowed for the execution of the works; I think that, so far as my own business is concerned, the time allowed was ample, as it included the whole of the summer months; the past year was rather an exceptional one with us; advertisements for silver engravers were of weekly occurrence, and most had to work over-hours, so as to leave no time for the execution of so difficult a work. I have been in the habit of telling the young men whom I train to the business, that slack times are our golden opportunities for improvement—each one is then able to follow his own bent, and great advance is generally made in knowledge and skill. The chairman correctly observed that it is to the rising generation of art workmen that these competitions will be most beneficial; I will add that it is important that men of mature years should give their time up to the furtherance of so good a cause. In my own workshop every stage of the process of engraving my competitive specimen was watched with the keenest interest by the young men and apprentices I am training; and I cannot doubt that seeds have been thereby sown which in time will show their fruit in the Society's Hall. Experienced engravers, to whom I have shown the photograph selected for competition, have strongly objected to the labour necessitated by the chequered back-ground. Doubtless it requires much time and care for its proper execution, but I have found in it a great source of effect—it acts as a middle tint, giving powerful relief to the strong lights and

shadows on the arabesque; and when we have mastered the difficult task of niello filling-in, it will prove a great means of giving due effect in graver-work. I think the Council would do well to apply a higher test of our power of drawing in the future competitions among engravers; I think it would tend to bring forward our most skilful men. In this year's work we had only to make a careful tracing; and I beg leave to make the following suggestion:—That we be invited to make a reduced copy of some figure-work of a high character; for instance, the South Kensington photograph of Marc Antonio's engraved figure of Lucrece, the drawing of which on the copper is ascribed to Raffaelle himself. The figure is seven inches in height; we might be invited to reduce it to four and a half or five inches; it would be a high test of our drawing capabilities. I would further suggest that, in order to give us an opportunity of showing whether we are capable of producing something with the stamp of originality about it, we be allowed to surround the figure with an arabesque border, say an inch in width, and comprising masks and emblems appropriate to so tragic a subject; a prize might be offered for the figure alone, and an additional prize to be competed for by those who felt sufficient confidence in themselves as to make an attempt at an original composition. In the matter of advertising, I believe the best means of making the offers of the Council known in the provincial towns, will be to advertise in the local newspapers of largest circulation. In this town the *Sheffield and Rotherham Daily Independent* and the *Sheffield Daily Telegraph* are largely circulated among the workshops. I would advise the insertion of the Council's programme for the year in these papers, three times a week for two weeks. I believe that all who are interested in this town would then know of it. There is every appearance of a brisk demand for art-work in the opening year; the Council must not, therefore, feel surprised if they meet a smaller number of responses to their offers than they desire and expect; but I have not a shadow of a doubt that these competitions will grow in importance year by year. Slack times follow busy as surely as winter follows summer, and when they again come round I believe you will find the walls covered with competitive examples; men will then in effect say, "I am here, capable of executing work like this, will any one employ me?"—I remain, &c., G. McKENZIE.

12, Tudor-street, Sheffield, Jan. 7, 1865.

MEETINGS FOR THE ENSUING WEEK.

MON. ...Society of Arts, 8. Cantor Lectures. Mr. B. Waterhouse Hawkins, "On the Reproduction of Natural Forms by Art and Manufacture." Lecture IV.
R. Geographical, 8½. Capt. Sherard Osborn, R.N., C.B., "Exploration of the North Pole."
Entomological, 7. Annual Meeting.
British Architects, 8.
Medical, 8. Dr. James Jones, "Inflammation as an Exciting Cause of Tuberculosis."

TUES. ...Medical and Chirurgical, 8½.
Civil Engineers, 8. Mr. T. Hawthorn, "Description of the Port and Docks of Marseilles."
Zoological, 8½.
Ethnological, 8. 1. Mr. Wallace, "On Civilisation in North Celebes." 2. Prof. Busk, F.R.S., "On Human Remains from Gibraltar."
Royal Inst., 3. Prof. Tyndall, F.R.S., "On Electricity."

WED. ...Society of Arts, 8. Mr. C. F. T. Young, "On the Best Means of Protecting London from the Ravages of Fire."
Geological, 8. 1. Mr. Julius Haast, "On the Excavation of Valleys by Ice." 2. Mr. James Bryce, "On the Order of Succession in the Drift-beds of Arran." 3. Mr. E. Ray Lankester, "On the Sources of the Mammalian Fauna of the Red Crag." Communicated by Prof. Huxley.
Archæological Assoc., 8½.

THURS...Royal, 8½.
Antiquaries, 8.
Philosophical Club, 6.
Royal Inst., 3. Prof. Tyndall, F.R.S., "On Electricity."

FRI.....Royal Inst., 8. General Sir H. Rawlinson, K.C.B., "On the Results of Cuneiform Discovery to the present time."

SAT.....R. Botanic, 3¾.
Royal Inst., 3. Prof. Marshall, F.R.S., "On the Nervous System."

Patents.

From Commissioners of Patents Journal, January 13th.

GRANTS OF PROVISIONAL PROTECTION.

Autograph stamps—3198—Hon. J. Hay.
Boots and shoes, manufacture of—3194—T. and J. Fagg.
Brushing the hair, mechanical apparatus for—3167—C. E. Bryant and S. Middleton.
Carpets, &c., manufacture of—7—J. Spencer and N. Broomhead.
Cavalry stables, connector applicable to bales used in—3211—J. P. Robinson.
Coke ovens—3214—H. Hicklin and C. Pardoe.
Coke ovens—3222—J. R. Breckon and R. Dixon.
Drying machine, centrifugal—3204—J. Rowberry.
Entertainment, construction of houses of—1—W. Muir.
Fan blowers—23—W. Ager.
Farinaceous food, article of—2684—B. R. Keith.
Fire-arms—3132—A. H. Renton.
Fire-arms, breech-loading—2912—J. Snider, jun.
Fire-arms, &c.—3196—R. A. Brooman.
Glass house pots, manufacture of—3075—E. Brooke, jun.
Governors—3169—M. Henry.
Governors—3182—J. Byrne.
Gun barrels, manufacture of—3111—P. A. Le Comte de Fontainemoreau.
Heavy bodies, apparatus for moving—3153—D. Millar.
Household fires, lighting—3180—J. G. Aram.
Hydrocarbon fluid lamps, burners for—3245—A. S. Macrae and A. Bayley.
Iron, furnaces used in the heating and melting of—3116—J. Ellis.
Jute, &c., treatment of—3191—J. Paterson.
Lamp feeders, construction of—3178—H. Edmonds.
Liquids, &c., warehousing or storing—3241—P. C. P. L. Prefontaine.
Looped fabrics, machinery for producing—3225—J. & W. Thornton.
Manual power, carriages propelled by—3259—T. Du Boulay.
Marine steam engines, anti-saline coating for—2605—L. Paviola.
Mine shafts, preventing accidents in—3208—C. H. Taylor.
Mules for spinning—21—J. Knowles and J. Banks.
Mules for spinning and doubling—3237—J. Dodd.
Nuts, manufacturing metallic—3188—G. Haseltine.
Ordnance, mounting—3077—A. Moncrieff.
Ordnance, preparing charges for, &c.—3231—D. Sutherland.
Oxygen gas, manufacture of—5—J. F. Parker and J. Tanner.
Paper board, machines for making—25—J. F. Jones.
Paper, manufacture of—15—L. D'Aubreville.
Pianos, manufacture of—3224—J. Bardies.
Pitch, treatment of—9—R. Irvine.
Portland cement, manufacture of—3221—J. Cleaver.

PATENTS SEALED.

1797. P. G. B. Westmacott.	1875. J. P. Chambeyron.
1805. J. Syme.	1876. J. P. Chambeyron.
1807. G. P. Harding.	1987. G. Haseltine.
1808. C. Whittaker & J. Cocker.	2033. E. A. Pontifex.
1809. J. Laubereau.	2092. R. Pilkington.
1811. W. H. Wilks.	2398. T. Bennett.
1817. J. Hart.	2421. H. Druce.
1821. J. Whitford.	2477. H. and F. J. Kemp.
1874. V. Wanostrocht.	2600. W. H. Harfield.

From Commissioners of Patents Journal, January 17th.

PATENTS SEALED.

1803. J. Maynes.	1861. A. Wydler.
1806. O. Phalp.	1862. L. R. Bodmer.
1812. J. Coton.	1864. W. Irwin.
1819. W. E. Gedge.	1865. J. Slater.
1824. A. Topp and J. Holt.	1866. M. Scott.
1825. J. Higgins.	1881. J. Newsome.
1827. W. E. Gedge.	1908. C. Eastwood.
1829. F. Peskett.	1979. A. Turner.
1834. G. Stevenson.	2169. A. V. Newton.
1840. P. Æ. Le Boulengé.	2841. T. E. Vickers.
1841. F. Gregory.	2927. F. Pfanhauser.

PATENTS ON WHICH THE STAMP DUTY OF £50 HAS BEEN PAID.

73. M. Wigzell.	92. J. Parker and J. and B. Wells.
83. J. White.	
109. C. Hill.	99. J. G. Marshall.
226. W. E. Newton.	106. W. Gorse.
287. W. E. Newton.	113. W. Cleland.
82. H. Charlton.	129. R. Romaine.

PATENTS ON WHICH THE STAMP DUTY OF £100 HAS BEEN PAID.

3178. T. Spencer.	73. R. Archibald.
83. E. Wilson.	

Registered Designs.

Clasp for securing cuffs or wristbands—Jan. 11—4683—T. Thomas, Great Barrow, near Chelmsford.
Chape and buckle for saddle girths and other bands—Jan. 16—4684—David Power and Sons, Walsal.
The people's clothes wringer—Jan. 17—4685—G. Askir, 4, Wellington-street, Blackfriars-road.